NEWSLETTER

JANUARY 1988

Spala

Fire Blight

Kherakhon

Paronpest

Feuerbrand

Bacterievuur

Feu Bacterien

Fuego Bacteriano

Zaraza Ogniowa

Lafha Nareya

Vaktiriako Kapsimo

Paerebrann

Ildsot

INTERNATIONAL WORKING GROUP ON FIRE BLIGHT RESEARCH

INTERNATIONAL WORKING GROUP

ON

FIRE BLIGHT RESEARCH

NEWSLETTER

from the

PLANT PROTECTION COMMISSION
International Society for Horticultural Science

in cooperation with

U.S. Deciduous Tree Fruit Disease Workers

and

European & Mediterranean Plant Protection Organization

JANUARY 1988

United States Department of Agriculture
Agricultural Research Service

Appalachian Fruit Research Station
Kearneysville, West Virginia, USA

IMPORTANT NOTICE TO OUR READERS

The 1989 newsletter will celebrate the tenth anniversary of this publication to keep the world-wide working group of fire blight researchers in touch and up to date. Through these years, however, our mailing list has become too extensive and there are probably many unnecessary mailings. Some people have moved or retired and failed to report their new address. Secretarial assistance has become more difficult to obtain and the cost of printing and assembling has increased considerably. For 1987, postage alone totalled $250.00. Also, in my own busy work schedule, it takes much extra time to keep up with all phases of this publication.

Therefore, starting with the 1989 issue, we must start adhering to the following guidelines for eligibility to receive the newsletter:

1. Be actively engaged or indirectly interested in fire blight research (students not included).

2. At any university department, experiment station or research laboratory, only one representive can be accepted.

3. In countries without fire blight, only one person per location (actively involved in pome fruit or rosaceous ornamental research) may be accepted (please make your choice).

Thus, in order to continue receipt of your newsletter, I herewith kindly request that everyone (except our contact persons) return the last page in this newsletter to indicate your interest. Any one not heard from by December 31, 1988, will be dropped automatically. I apologize for this needed and yet long overdue action, but we must take these measures in order to be able to maintain our newsletter for all those who really need it.

Letter from the Editor

In 1987, Czechoslovakia reported its first occurrence of fire blight ("Spala") in the immediate area of Prague. The disease was apparently observed in 1986 on hawthorn and cotoneaster at 4 sites and again in 1987 on hawthorn at 18 sites as well as on apple and pear. In 1985-86, fire blight was reported in the German Democratic Republic on hawthorn from the regions of Thuringien and Saxonia, and the bacterium presumably found its way across the Erts Mountains into Czechoslovakia.

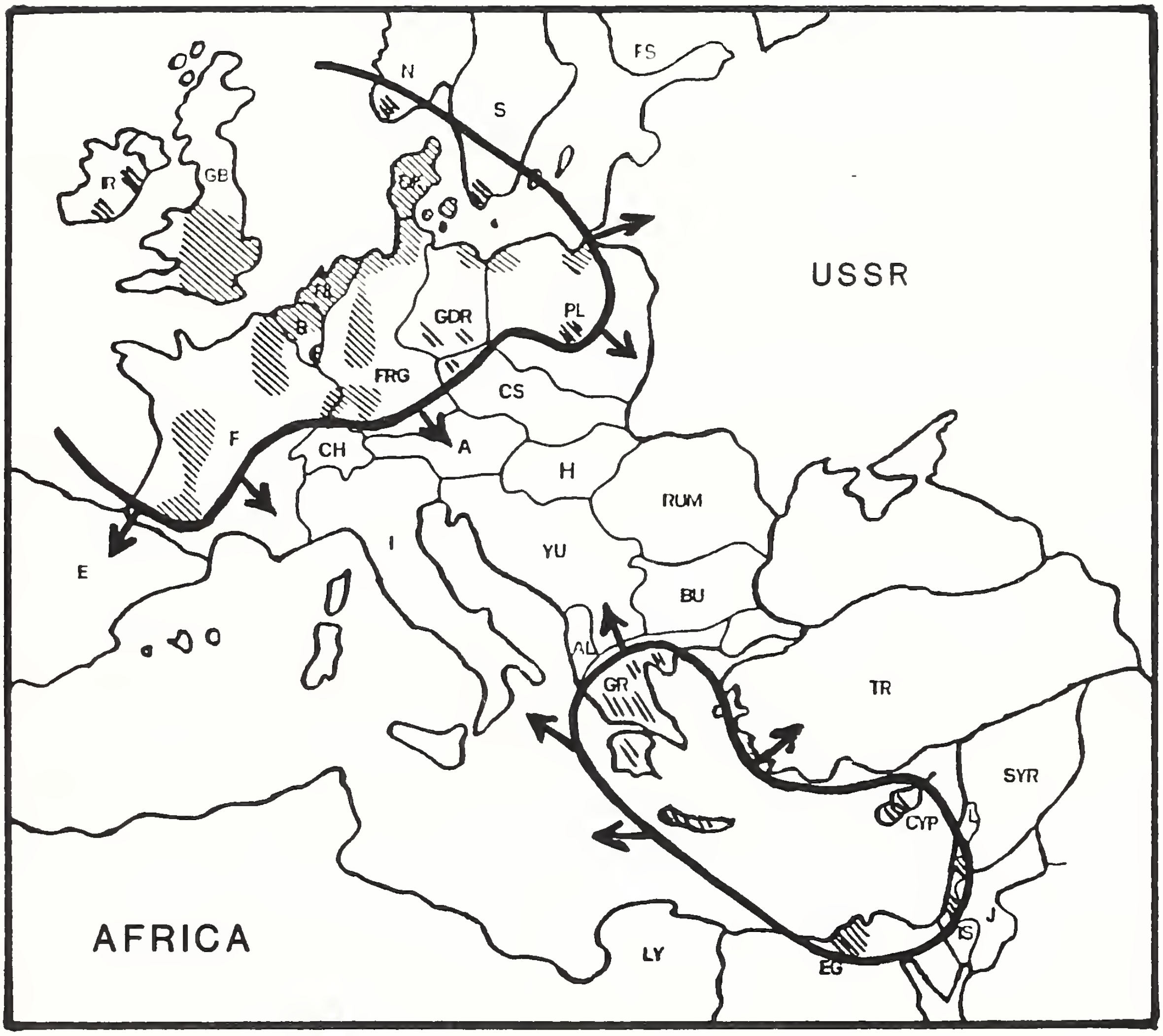
Also, in 1987, fire blight ("Vaktiriako kapsimo") became widespread throughout Greece, spreading from the critial sites on the islands of Crete as far north as the Kavala region (north of Thessaloniki), west to the island of Kefallinia (Ionian Sea), east to the island of Mytilini (near Turkey) and several locations on the Peloponesus and the immediate mainland to the north. The disease was reported on hawthorn, mespilus, and numerous varieties of apple and pear.

Thus, there is absolutely no doubt anymore that the experiences in Israel (1985) and Greece (1987), of such first-time widespread disease occurrences throughout these countries, are indicative that *Erwinia amylovora* is able to spread over long distances in the epiphytic form in air currents, possibly aided by insects or migratory birds.

Since its first occurrence outside North America (New Zealand, 1919; England, 1957; Egypt, 1962), fire blight has now been reported from 20 countries and is known in 13 different languages.

Tom Van der Zwet

TOM VAN DER ZWET, Secretary
North American Section
International Working Group
on Fire Blight Research



Distribution of fire blight in western Europe

and eastern Mediterranean regions,

as recorded by December 1987.

PRESENT STATUS AND NEW OCCURRENCES OF FIRE BLIGHT

NEW ZEALAND

Very little fire blight seen in 1987/88 season, although weather conditions were conducive.

Chris Hale
Auckland

EAST GERMANY

In 1987, we had only small outbreaks of fire blight on hawthorn hedges because of cold temperature in spring and summer.

Helmut Kleinhempel
Aschersleben

POLAND

The disease occurred sporadically in some locations of the previously affected regions.

Piotr Sobiczewski
Skierniewice

ENGLAND

Fire blight continued to maintain a low profile in 1987 generally as climatic conditions were not faborable for disease development until late summer when spread in hawthorn became very noticeable.

Connie Garrett
East Malling

NORWAY

The eradication program and the survey of the district where the disease was discovered in 1986, were continued. Because of cold temperatures during spring, and an unusual dry summer, new outbreaks were few, and none were more than 10 km. outside the original region. Still Cotoneaster spp. were the only hosts.

Arild Sletten
Asa-NLH

SWEDEN

A very intense survey was carried out during 1987 in the region where fire blight was found in 1986. Not a singel new attack has been found. A few newly attacked trees in the diseased orchard have been eradicated. The weather has been unusualy cold during the summer 1987 with a lot of rainfall.

Maria Graberg
Jonkoping

IRELAND

Following the discovery of fire blight on a plant in a Dublin suburb in autumn 1986, a nationwide survey was undertaken and the disease was found to be largely confined to the Dublin area. An eradication programme was initiated and is continuing.

During 1987, fire blight was found at 23 sites in the Dublin area, at 3 sites in North Wicklow (adjacent to Dublin) and at one site in each of the counties Kildare and Mayo. The plants affected were species of *Cotoneaster* (50%), *Pyracantha* (37.5%), *Sorbus* (10%), and *Malus* (2.5%).

Patrick Walsh
Dublin

WEST GERMANY

In the north of Germany the disease was light because of unfavorable weather conditions. Only *Crataegus* and the highly susceptible Cotoneaster species *Cotoneaster salicifolius* could be found with blossom and shoot tip infections. In Niedersachsen, a first distribution in the areas of Göttingen and Braunschweig mainly on hawthorn hedges was found.

In the southern parts, fire blight was also not severe because of cool temperatures at blossom time and a cool summer. Only in come restricted areas an attack in orchards could be found; for example in Rheinland-Pflalz (Ingelheim) on the pears 'Gellerts' and 'Triomph de Vienne' and on the apple variety 'James Grieve' (Ahrweiler). Moreover, in the Stuttgart area, a high incidence of fireblight could be observed mainly on big old perry pears in the landscape. Several of these pear trees were eradicated. As in the north, the ornamentals *Crataegus* and *Cotoneaster salicifolius* were mainly attacked. Additionally, *Sorbus aria* as a tree along the streets showed severe infections (Area Stuttgart).

Wolfgang Zeller
Dossenheim/Heidelberg

CYPRUS

During 1987, the weather conditions were again very favorable for the fire blight blossom and shoot infection of pears and apples.

Therefore, further spread of the disease in new areas (Ayios, Ioannis, Politico, and Lythrodhonta of Nicosia district) was observed. There was a worstening of the situation in the orchards with slight or mild infections in previous years. Extremely heavy damages were observed on pear trees in Kyperounda area. Slight infection was observed on loquat trees in Eyrechou area.

Under the provisions of the project for the replacement of the susceptible pear and apple varieties to fire blight, put in force in October 1986, about 15,300 severely infected trees were uprooted and an amount of C 30,500 was paid to the growers as subsidy for the uprooting.

Maria Dimova-Aziz
Nicosia

FRANCE

1987 has been an unusual year, with pretty good conditions (high temperatures) during late pear blossom, in spring. Nevertheless, due to cool and dry weather in May, the overall activity of the disease has been limited, as far as spread into new areas is concerned.

Some damage has been reported locally on apple, and one case described in a fruit nursery (apple scions). Plants have been destroyed for sanitation.

A single new place with fire blight has been detected during the year 1987: Besancon, in the North-East of the country. Symptoms were found there on ornamentals in July. No other report of fire blight has been issued from this area. This new focus is far from any other known place with fire blight in France; the nearest one (150 km) may be in the Rhine valley.

Jean Pierre Paulin
Angers

NETHERLANDS

Fire blight was not a serious problem in our country in 1987. Due to the weather conditions in spring and in summer as well as to the control measures taken, infection level was low. Still there was some fire blight incidence in hawthorn outside the protected zones and in pear orchards. As particularly fruit growers sometimes hesitate to take the necessary stringent measures in their own plantings, these infections were mainly caused by hold-over infections from 1986. Through the years since 1984, the infection level, specially in the protected zones, is decreasing more and more.

Rien van Teylingen
Wageningen

CZECHOSLOVAKIA

Fire blight was found for the first time in Czechoslovakia (CSR) in 1986. Further new infections were observed in 1987. A survey showed that the disease is presently restricted to the territory of Prague city. In 1986, there were local foci of blossom blight, leaf and shoot blight on *Crataegus* (3 sites) and *Cotoneaster* (1 site), but also on *Malus* and *Pyrus* (1 tree each).

The indentity of the fire blight pathogen was confirmed by morphological, cultural, biochemical, and serological characteristics and the immature pear fruitlet test. Two of our *Erwinia amylovora* isolates have been deposited in the Czechoslovak Collection of Microorganisms (under designation of CCM 3979 and CCM 3980).

All diseased trees or shrubs have been eradicated and destroyed. In 1988, a intense servey is to take place in all areas of the CSR.

For the years 1983-1986, the potential for fire blight activity was assessed according to the Billing system. As can be judged from the potential infection days during flowering of *Crataegus* in the last four years, there was the highest risk for fire blight outbreak in 1986.

The Czech name for fire blight is "spala".

Vaclav Kudela
Prague

GREECE

Fire blight was a serious problem for Greece in 1987. The disease was recorded in almost every part of the country where pears and apples are cultivated. In some areas, like the island of Crete, and the districts of Larissa, Magnessia, and Pieria on mainland Greece, the disease appeared as epidemic. Infection was first observed on blossoms of pears, the second half of April and continued as shoot infection on pears and blossom and shoot infection on apples, quince and wild pears (*Pyrus amygdaliformis*). Infection was observed an all pear varieties cultivated in Greece, but the most susceptible varieties seem to be 'Santa Maria', 'Passa Crassana', 'General Leclerc', 'Kontoula', and 'Krystali', while the varieties 'Abate-fetel' and 'Coscia' were the most resistant ones. On apples the incidence of the disease was milder than on pears. Both blossom and shoot infections were observed. The most damaging were shoot infections. Quince trees were very susceptible and the infected trees were severely damaged. Other hosts found infected were: *Crataegus* sp. (rarely) and *Mespilus germanica*, *Cotoneaster* spp., *Pyracantha* sp., *Eriobotrya japonica* (Loquat) were not found to be infected.

The disease incidence and the way it appeared is difficult to explain. The simultaneous disease occurrence in different areas all over Greece is inconseivable, taking into account that there was no disease history in these areas. The weather conditions, mild winter and rainy cold spring, favored the build up of inoculum and spread of the disease. Intensive control measures, including severe pruning of infected parts and application of antibiotics and copper compounds were undertaken by the extension service of the Ministry of Agriculture. Severely affected orchards, especially of pears and quinces, were up-rooted and destroyed.

Peter Psallidas
Kiphissia (Athens)

ITALY

No cases of fire blight have been found in Italian nurseries or orchards. Moreover, official phytosanitary inspections and lab analyses of imported material have not detected *Erwinia amylovora*.

Carlo Bazzi
Bologna

SPAIN

Up until now, no cases of fire blight have been found in Spain.

Christina Noval Alonso
Madrid

HUNGARY

There is no fire blight in Hungary.

Erzsebet Simon
Hodmezovasarhely

SWITZERLAND

No fire blight detected yet in Switzerland. There were no changes in our fire blight strategy. The prediction service has been set up finally for 17 weather stations. Susceptibility tests have been followed abroad.

Richard Grimm
Wadenswil

AUSTRIA

No fire blight at all in Austria.

Marianne Keck
Vienna

SOUTH AFRICA

Disease does not occur in South Africa.

Martin Hattingh
Stellenbosch

AUSTRALIA

No fire blight has been recorded within Australia to date. Stringent plant quarantine restrictions apply to imports of fire blight hosts.

David Cartwright
Adelaide

JAPAN

Fire blight has not been recorded in Japan.

Koji Fujita
Aomori

NORTH AMERICA

WEST VIRGINIA

The year 1987 was not favorable for the development of fire blight. Weather conditions during apple bloom were slightly less than optimum.

Joseph Barrat
Kearneysville

GEORGIA

The new apple selection block at Byron, Georgia had a light incidence of fire blight in 1987. Apparently, the most susceptible selection was 634011-96 (NJ 125355 x NJ 6055). Lighter strikes were noted on 88-82 ('Mollie's Delicious' x NY 45500-3), 103-9 ('Mollie's Delicious' x ILL V1019-101), 239-5 ('Golden Delicious' OP), 6132-205 (VA QH11-75 x 'Grove'), and 634005-197 ('Williams Red' x NJ 6055). Escapes included cvs 'Blairmont' and 'Mollie's Delicious' plus some 28 other selections. Potential for future infestations of epidemic proportions is considered to be high. The new selection block at Blairsville, has not yet had fire blight.

Jim Thompson
Blairsville

UTAH

Weather conditions in 1987 were ideal for blossom blight in apples but not pears. Pears had completed bloom when the warm, rainy weather occurred. Infections were sporadic and not widespread but in some cases were very serious. The most severe infections were seen on young trees of 'Rome' and 'Granny Smith' varieties. In some orchards there were over 200 strikes per tree with the infection progressing into the main trunk, killing 5-year-old trees. Our mean temperature prediction model was accurate in advising no sprays for pears and frequent sprays during the bloom period of apples.

Sherm Thomson
Logan

CONNECTICUT

Fire blight was not a severe problem in 1987.

Sharon Douglas
New Haven

PENNSYLVANIA

Fire blight incidence in 1987 was limited to orchards in Pennsylvania where the disease was present the previous year or where the orchard had a history of a fire blight problem. Blossom blight was very light, being limited to blossom that opened late. Favorable environmental conditions for blossom infection occurred at least two times during bloom, but an apparent lack of inoculum on overwintering cankers until the late bloom stage was attributed to this low incidence. In a few previously infected orchards, severe terminal blight was present by late June. These incidences are believed to be associated with the presence of such insects as apple leaf hopper and green apple aphid. Populations of these insects observed in at least one orchard was, however, considered to be low.

Kenneth Hickey
Biglerville

CALIFORNIA

The more blight-prone Sacramento Valley areas of pear production experineced little blight after intense control efforts aimed at predicted high epiphytic bacterial populations in blossoms. A few orchardists experienced severe epiphytotics, however. Also, more interest has been shown in blight control in the relatively new industries of 'Granny Smith' apple and Asian pear production. Blight developing in the Sacramento Valley in 1987 arose during rainless weather.

In the later mountain districts, which are historically less problematic for blight, pear ('Bartlett') orchardists in two areas of Lake County experienced very severe blight, which initially arose during rainless weather most severely in orchards using water to protect against late season frost or irrigating early in the season of an otherwise warm, dry spring. Later spring rains and hail secondarily perpetuated the epidemic to nearby fruit and shoots.

Broc Zoller
Yuba City

MEXICO

Fire blight on pears and apples in Casas Grandes, Chihuahua in 1987 was very damaging, some orchards with up to 100% infection.

Leopold Fucikofsky
Montecillos (Chapingo)

ALBERTA

1985, 1986, and 1987 - June was dry in all of these years in Alberta. Heavy rains in early to late July. Very little fire blight damage in general on apples, crabapples, and mountain ash. In each of these years, we could find fire blight symptoms on 'Royalty Crab', the super susceptible.

Ian Evans
Edmonton

SASKATCHEWAN

Fire blight infections in our orchards are much less of a problem lately than they were five years ago. The fire blight in our orchards all but disappeared at about the same time as we seeded the orchard lanes to grass and started controlling weeds under the trees with herbicides. This orchard floor management has not been experimentally shown to control fire blight at this location.

Rick Sawatzky
Saskatoon

ONTARIO

Following a mild winter, spring in Ontario was warm and dry and this was followed by a dry and hot summer. Not surprisingly, fire blight was of little concern to apple and pear growers, except for those in the Niagara peninsula and in the extreme south-western portion of the province. Fire blight occurred on susceptible apple cultivars in late June following rain showers and was widespread by the end of the season in Essex and Kent counties. For Niagara pear growers, 1987 was worse than 1986, in spite of the dry spring. Streptomycin spraying was common and removal of suckering proved to be effective for both psylla control and reduction of fire blight inoculum.

Gordon Bonn
Harrow

BRITISH COLUMBIA

Fire blight in the Okanagan Valley of British Columbia was not a problem in 1987. It only occurred sporadically in a few orchards. One pear orchardist reported poor control with streptomycin and attempts will be made to monitor this orchard more closely in 1988.

Peter Sholberg
Summerland

DETAILS ON CURRENT FIRE BLIGHT RESEARCH REPORTED FROM UNIVERSITIES AND EXPERIMENT STATIONS

PENNSYLVANIA

A new research project is being initiated in Pennsylvania at the Fruit Research Laboratory by K.D. Hickey and Gregory Clarke, a PhD candidate at Penn State. The major thrust of the research is: to evaluate the dependability of heat unit accumulation from green-tip to bloom, reported by Steiner, as an indicator of presence of active bacteria in overwintering cankers; efficacy of copper sprays applied before bloom in reducing blossom infection; study the relationship of presence of orchard insects with piercing and sucking mouth parts to incidence of terminal blight epidemics; and the development of a computer software package for the management of fire blight in orchards

K.D. Hickey
Penn State University
Fruit Research Lab

WEST VIRGINIA

When pear and apple blossom were inoculated with a micropipet (50 ul) containing 10^2, 10^5, or 10^8 CFU/ml under adverse 1987 weather conditions, significantly more blossoms blighted following inoculation with 10^8 than with 10^5 or 10^2 CFU/ml. The precise incubation period (between inoculation and earliest visible symptom) under the existing weather conditions of the period 24 April-10 May was determined as 10 days for both 'Bartlett' and 'Jonathan'. When blossoms were inoculated one week later, these periods were reduced to 5 and 8 days, respectively. Temperature appeared a more significant factor for blight development than rainfall, which confirmed our observations on the severe natural blossom blight in 1985.

T. van der Zwet
USDA-ARS-AFRS

ONTARIO

Several scab resistant apple cultivar introductions from the Ottawa breeding program proved to be fire blight resistant (see Bonn and Warner, 1987).

G.W. Bonn
Agriculture Canada
Research Station

NEW ZEALAND

A detection technique for Erwinia amylovora has been developed using a cDNA probe which will reliably detect 10^2 bacteria inoculated into the calyx end of immature fruit. E. amylovora has been detected in calyxes of fruit from orchards showing symptoms on shoots, but not from orchards where no symptoms were seen on detailed inspections.

C.N. Hale
Dept. Sci. Ind. Res.
Plant Disease Division

EAST GERMANY

Current research projects at the Institute of Phytopathology in Aschersleben are: 1) further investigations on methods of warning and forecasting; 2) evaluation of pear, apple and ornamental varieties for resistance to fire blight; and 3) continuatioin of control trials in pear, apple, and ornamentals.

H. Kleinhempel
Inst. fur Phytopathologie

POLAND

Prediction of fire blight. The theoretical potential of fire blight activity (PFA) in 3 regions of the country were determined according to the Billing system (1984). It was found that during spring there were no favorable conditions for the mutiplication of Erwinia amylovora and for the infection of blossoms of the main host plants. The period of shoot growth of apples and pears can be characterized by low PFA in the center of the country (7 completed incubation periods) and middle to high PFA in north regions (13-14 incubation periods). The occurrence of the disease in central Poland was very low as expected. However, in the remaining 2 regions, higher intensity of fire blight could be expected, but it occurred sporadically. It appeared that the high frost damages resulted in the reduction of natural sources of infection and susceptibility of plants.

Efficacy of chemicals for the control of fire blight. The tests using pear fruitlets were conducted with the following chemicals; Miedzian 50 (Organika-Azot, Poland), Kocide 101 (Kocide Chemical Corporation, USA), Champion WP (Agtrol Chemical Products, USA), Agrimycin 17b(Pfizer INc., USA), Bronopol (List-Fahlenberg, GDR), S-0208 (Sumitomo, Japan). The best protective activity was exhibited by Agrimycin 17. The copper chemicals at concentration of 0.5% were also quite effective. The activity of S-0208 at a conc. of 0.03% was poor, but an increase in conc. to 0.06% resulted in significantly better activity. No phytotoxic effect was observed. Bronopol was practically not effective.

P. Sobiczewski
Res. Inst. of Pomology

ENGLAND

At Wye, a genomic library of *E. amylovora* is being used to find clones which complement non pathogenic mutants. Two such clones restore virulence to isolate P66. It is hoped to determine the number and function of virulence given in capsulated P66.

Among several nitrosoguanidine-derived/non pathogenic mutants of *E. amylovora*, several complement each other in the pear slice test, although both partners are capsulated. These should be valuable in studies on genetics and physiology of virulence.

WEST GERMANY

A monitoring study on *E. amylovora* on different apple varieties was done in a scion garden and in 3 apple orchards in the South of Hessen. The population dynamics of the pathogen was followed during the season 1986 and 1987 and correlated with the forecasting system of Billing. Additionally, the other saprophytic and antagonistic bacteria of the phyllosphere will be controlled with the aim for a biological control method.

A new fireblight test plot was established in 1986 in Kirschgartshausen near Heidelberg with a sortiment of pear and apple varieties for resistance studies. Morever, newly developed Cotoneaster lines are tested on their field resistance and control experiments with new bactericides are planned.

W. Zeller
Biologische Bundesanstalt

CYPRUS

For the control of fire blight blossom infection, two trials, one on pear and one on apples, were carried out during 1987. The Sumitomo compound S-0208 (an oxanilic acid analogue) gave excellent results with 97% blossom protection of pears and 93% of apples in comparision with 76% of Copac E (cuprammonium) and 70% of Cupravit (copper oxychloride).

M. Dimova
Dept. of Agriculture

NETHERLANDS

By means of many field observations, H.J. Schouten (Agricultural University) and M. van Teylingen (Plant Protection Service) are studying the relationship between pear and hawthorn, with respect to fire blight. The attention is focused on the spatial distribution of the disease in areas with pears and hawthorns.

Seedlings of the following species were heavily attacked after artificial shoot inoculation: C. adpressus, C. angustifolius, C. boisianus, C. giraldii, C. horizontalis, C. integerrimus, C. kitaibelii, and C. reticulatus. Only seedlings of C. multiflorus proved partly to be resistant.

In the progenies of Pyracantha, the cultivars 'Dant's Red' and 'Shawnee' proved to transfer their resistance to fire blight.

Seedlings of Crataegus arnoldiania, C. douglasii, C. robesoniana, and C. succulenta could resist the test.

A.S. Bouma
Res. Station for
Nursery Stock

In trials under natural infection conditions on pear, Cotoneaster watereri 'Pendulus' and Cotoneaster salicifolius floccosus, Plantomycin (streptomycin) and Koper Bayer (copperoxychloride) were mostly insufficiently active in a spraying scheme related to weather conditions. "Calendar spraying" was effective. Next year we will try to improve the spraying scheme. In a trial on flowering Cotoneaster dammeri 'Coral Beauty', the incubation period after artificial inoculation with 10^5, 10^6 or 10^7 cells/ml E. amylovora was equal.

The efficacy of the bactericide S 0208 was tested on flowering 'Coral Beauty'. In the preventive trial, 300 ppm a.i. S 0208 was less active than Plantomycin (106 ppm streptomycin) and Koper Bayer 1000 ppm copperoxychloride). In the 22 hours curative trial, S 0208 has also shown to be less than Plantomycin.

T. Kooistra
Plant Protection Service

GREECE

A detailed study of climatic data of some selected areas of Greece and an explanation of last year's epidemic is underway. In the framework of the E.E.C. (Agrimed) program the computer-program warning system developed by the French Meteorological Office is to be applied in Greece (Larissa).

Control and toxicity experiments with bactericides under Greek conditions, including the native varieties of pear and apples, have been undertaken.

Study of the characteristics of the Greek isolates of Erwinia amylovora and comparision with isolates from other countries is continued.

Epidemiological studies on the overwintering and dissemination of the pathogen are continued.

In the framework of E.E.C. (Agrimed) program an experimental plot is to be established in Chania (Crete), for the study of the behaviour to fire blight infection for some apple and pear varieties as well as some other susceptible species (loquat, etc.) of Mediterranean origin.

P.G. Psallidas
Benaki Phytopath. Inst.

ISRAEL

Dr. Eva Steinberger is working on a BARD Postdoctoral fellowship to study the differentiation of E. amylovora strains based on restrictions fragment length polymorphism.

Sprav applicatons were made to determine the efficacy of bactericides for the control of fire blight in three pear orchards at: 1) Kvuzt Schiller, in the Central costal plain (25-year-old, fire blight infections were detected in 1986 on few trees); 2) Yad Mordechay, in the south coastal plain (25-year-old, heavy fire blight in 1985); 3) Revivim, in the Negev desert (5-year-old, heavy fire blight in 1986, late fire blight in 1987). The trees were sprayed to run-off by hand gun at 2.7 bars. During the bloom period, three six-tree plots, replicated three or four times were sprayed in the 3 tests reported.

The spring of 1987 was not favorable for fire blight, because of low temperatures during the bloom period. Although March 1987 was very rainy, the number of risk days for Erwinia amylovora were few (14 March and 24 March), resulting in non fire blight incidence all over Israel, except in the south in the Negev. Fire blight infections were detected on a few 'Spadona' blossoms at Revivim on 22 March 1987, but in the test the disease was evident only on 26 April on late blossoms of some 'Costia' trees. Because of these late infections in the experiment site, the efficacy of the test bactericide could not be evaluated. Phytotoxicity on the leaves (black margins and twisted leaves), petal burn and fruit russet were evident on 'Spadona' trees at Kvuzat Schiller and on 'Costia' trees at Revivim, sprayed with Kasumin 2% liquid 6.5 ml/l. No phytotoxicity, russeting or adverse effects were observed in any of the other treatments: Streptomycin, flumequine (MBR 10995) and Copac E.

Fire blight infections were found for the first time on early apple cultivars ('Slor', 'Anna', and 'Ein-Shemer'), during March-April in some orchards in the Negev.

E. Shabi
ARO, Volcani Center

ITALY

The breeding program for pear resistance to the disease, started by the Istituto Sperimentale per la Frutticoltura in Rome, under the EEC Fire Blight Working Group, continues. As regards rountine phytosanitary checks on imported hosts plants, the criteria laid down by the Italian Phytosanitary Legislation are observed.

C. Bazzi
Istit. Patol. Vegetale

NEW THESES AND DISSERTATIONS

Walter, Petra Sabine. Verhalten von E. coli Plasmiden in dem Pflanzenpathogenen Bakterium Erwinia amylovora. University Heidelberg, Diplombiologe (Master) 1987.

Schultz, Irina. Untersuchungen zum Wirkungsmechanismus des extrazellulären Polysaccharids (EPS) von Erwinia amylovora auf den Phenolstoffwechselder Quitte, Cydonia vulgaris. Diplombiologe (Master) 1987.

Kakoulidis E. Studies on fire blight disease on pears in Achaia District. Agricultural University of Athens (MS) 1988.

Rousseau, M. Manifestations de la resistance au feu bacterien de microboutures de poirier cultivees in vitro. Nantes (DEA) 1987.

Marcais, B. Etude du comportement de mutants d'Erwinia amylovora affectes dans leur pouvoir pathogene. ORSAY(DEA), 1987.

Jacquin, F.X. Etude de l'influence de l'alimentation minerale sur la sensibilite du Pyracantha au feu bacterien. ENSAA DIJON (Dipl. Ing.) 1987.

Nachtigall, Marion. Erprobung antimikrobiell wirkender Substanzen zur Bekämpfung von phytopathogene Bakterien in vitro und in vivo unter besonderer Berüsksichtigung des Feubranderregers Erwinia amylovora (Burrill) Winslow et. al. AdL Berlin (Diss. A) 1986.

Richter, Klaus. Bekämpfung von Erwinia amylovora (Burrill) Winslow et. al. an Ziergehölzen. Akademie der Landwirtschaftswissenschaften, Berlin (Diss. A) 1988.

Ficke, Werner. Die Rindenerkrankungen des Apfels unter besonderer Berücksichtigung der in der DDR vorkommenden Erreger. AdL Berlin (Diss. B) 1985.

MISCELLANEOUS NEWS

Mr. David Hunter, currently completing a PhD. program at the University of Guelph, has repalced Dr. Frank Kappel who has transferred to the Summerland Research Station in British Columbia. David will be continuning the research program in pear breeding and management at Harrow.

Dr. P.G. Psallidas and Dr. J. Tsiantos were the Greek Delegates to the E.E.C. Fire Blight Workshop meeting in Brussels, February 3, 1987.

Dr. J. Tsiantos attended the E.E.C. - Agrimed meeting in East Malling, England November 1987 on chemical control of fire blight (future activities).

June 26-28, 1987 the E.E.C. - Agrimed working Group on fire blight has held its meeting in Chania, Crete. At this meeting which was attended by 32 scientists (18 members of the group and 14 local agronomists) the last developments on fire blight research, epidemiology, spread and control were presented and the future activities of the group were discussed.

The inaugural meeting of the U.K. Fire Blight Group at East Malling on December 9, 1987 was attended by 23 people, 9 from the Institute of Horticultural Research, 12 from University departments and 1 grower. The morning session on biology of fire blight and the afternoon session on structure and genetics of E. amylovora were followered by lively discussions. The second meeting will be at the University of Bath in 1989.

The EEC Agrimed Fire Blight Group planning meeting in Brussels in February and field meeting in Crete in June was attended by Connie Garrett and Eve Billing. A sub group on control was convened by Connie Garrett at East Malling in November when plans were made for the 1988 spray program coordination and production of a survey of control studies in E.E.C. countries in the past decade.

Dr Zutra was appointed as a member on a panel of Bacteriological Diseases of Plants (EPPO). Following the first meetng in November in Brussels, he visited with Dr. Paulin for one week.

Drs. Paulin and Jacquant Ramon visited Israel March 30-Arpil 6 and held discussions on epidemiology and blight forecasting.

FUTURE MEETINGS

1988

August 20-27:

5th International Congress of Plant Pathology
Kyoto, Japan

November 11-17:

Annual meeting of American Phytopathological Society
San Diego, California, USA

1989

June 11-16:

7th International Conference on Plant Pathogenic Bacteria
Budapest, Hungary

June 19-23

5th International Working Group on Fire Blight Research
Limburgs Universitair Centrum
Diepenbeek (near Hasselt), Belgium

For details, contact Mr. T. Deckers

FALLEN LEAF LAKE CONFERENCE

ABSTRACTS ON ERWINIA AMYLOVORA

ON THE GENUS ERWINIA

FALLEN LEAF LAKE

SOUTH LAKE TAHOE

CALIFORNIA

SEPTEMBER 17-20, 1987

MOLECULAR GENETIC ANALYSIS OF MOTILITY AND CHEMOTAXIS OF ERWINIA AMYLOVORA

* Susanne Beck von Bodman and Stephen M. Ries
Department of Plant Pathology
University of Illinois
1102 South Goodwin Avenue, Urbana, IL 61801

Erwinia amylovora, the causal agent of fire blight disease of pear, apple and other rosaceous plants has evolved highly specialized chemotactic and motility properties in response to organic acid components of blossom nectars from its natural hosts. This phenomenon is significant as blossoms provide an important port of entry for the pathogen into the host plant. We are studying the nature of this specialized pathogen-host plant interaction by means of modern molecular genetic methodology. Specifically, we partially digested genomic DNA from E. amylovora with EcoRI and Sau3A restriction endonucleases and ligated this DNA into the broad host-range cosmid vector pLAFR3 to obtain a cosmid library of E. amylovora DNA. We have also isolated chemotaxis and motility deficient mutants of E. amylovora by transposon mutagenesis utilizing the conjugative suicide plasmid pGS9::Tn5(Kan^R) of E. coli WA803. Motility and taxis deficient mutants exhibit unique swarm morphologies distinctly different from those of wild-type E. amylovora on soft agar minimal medium swarm plates containing kanamycin. We will utilize the cosmid library of E. amylovora to complement the various taxis and motility mutations so as to localize the genes specifying these properties.

INOCULATION OF *IN VITRO* APPLE PLANTLETS WITH *ERWINIA AMYLOVORA*. J. L. Norelli and H. S. Aldwinckle*. Cornell University, Geneva, NY 14456.

In vitro plantlets are being used to determine the virulence of strains of *Erwinia amylovora* to the apple rootstock 'Novole'. Rooted 'Novole' plantlets are inoculated by cutting one or more leaves with scissors dipped in a 5×10^7 cfu/ml suspension of *E. amylovora*. Fourteen days later, plantlets inoculated with strain Ea 266, which is virulent to 'Novole', show typical fire blight symptoms including systemic necrosis and watersoaking. Plantlets inoculated with strain Ea 273, which is virulent on most apple cultivars but avirulent on 'Novole', show no systemic symptoms of fire blight. When 39 strains of *E. amylovora* were evaluated for virulence to 'Novole', there was a significant association between data obtained from the *in vitro* assay and from inoculation of potted 'Novole' plants in the greenhouse. The *in vitro* assay indicated that of 143 field isolates of *E. amylovora* from N. America, Europe and Egypt that were tested, only 14 strains were virulent to 'Novole'. All 14 virulent strains were from the eastern and central USA, and Canada. Although symptomatically there was a good correlation between the *in vitro* and greenhouse assays, the growth of the bacteria following inoculation differed in the *in vitro* and greenhouse plant material. In greenhouse 'Novole' plants, populations of both virulent and avirulent strains decreased 6 hr after inoculation. Between 6 and 72 hr after inoculation the virulent strain increased by 10^2, whereas the avirulent strain increased very little. In *in vitro* plantlets there was no decline in population after inoculation, instead cells of both virulent and avirulent strains increased by 10^4 and 10^2, respectively, between 0 and 96 hr after inoculation. The *in vitro* virulence assay can be adapted readily for use as a resistance screen.

CREATION AND ANALYSIS OF VIRULENCE MUTANTS OF ERWINIA AMYLOVORA STRAINS

Klaus Geider*, Peter Bellemann, Frank Bernhard, Marianne Metzger, Ines Schäfer, Richard Theiler, Sabine Walter, and Wolfgang Zeller§
Max-Planck-Institut für medizinische Forschung, Jahnstr. 29, Heidelberg;
§, Biologische Bundesanstalt, Heidelberg-Dossenheim; Fed. Rep. of Germany.

We have used the instability of bacterial plasmids in Erwinia amylovora strains to create transposon insertions in these host cells. For one strain a pBR-Tn5-mob plasmid was useful as a donor of the Tn5. After transfer of the F-episome the cells were infected with the filamentous phage fd. Its methylation pattern after propagation in E. amylovora strains corresponded to E. coli K12-strains, which was also shown for plasmids transformed into E. amylovora. A specially designed fd-plasmid with Tn5 inserted in gene 2 was used as suicide vector for transposon mutagenesis in Erwinia. Another donor for transposons is the Ti-plasmid of Agrobacterium tumefaciens when bearing Tn5. The plasmid is efficiently transferred not only to Escherichia coli but also to Erwinia strains. As it cannot replicate in those bacteria, only the co-transferred transposon survives in the recipient cell.

Tn5-insertions in E. amylovora were screened on pear-shoots and pear-slices. On growing cultured pear cells virulent strains of E. amylovora overgrew the plant cells after 10 days and produced bioluminescence at that time when carrying the lux-operon, whereas avirulent mutants caused a faster killing effect on pear cells. Cultured tobacco cells or grown out pear cells were immediately attacked by both classes of Erwinia strains. Some of the mutants were deficient in EPS-production. No homology was found for cloned DNA fragments with cellulase and pectate-lyase genes of Erwinia carotovora to DNA from E. amylovora. The encoded enzymes were expressed in E. amylovora.

PATHOGENICITY FACTORS OF ERWINIA AMYLOVORA

Richard M Cooper* and David Youle, University of Bath, BATH BA2 7AY, AVON, UK.

From an intercellular location E.amylovora induces leakage and eventual death of host cells. In contrast to soft-rot erwiniaa, wall-degrading enzymes are lacking. EPS is a prerequisite for virulence but is not toxic. A search for other potential pathogenicity determinants using a bioassay with suspension-cultured apple cells, revealed a low MWt (<1000D) toxin in concentrated fluids from the interaction between host and bacterial cells; only that from virulent isolate (T) or an avirulent non-capsulated mutant (E8) capable of inducing cell leakage were toxic, whereas fluids from capsulated avirulent (P) were not. Direct contact between host cells and bacteria is required but there is a lag phase of about 4 hrs before host cell death begins. The lag can be circumvented by preincubation of bacteria with host cells. Conditioning of E.amylovora results from a low MWt (<500D) elicitor(s) diffusing from host protoplasts (host wall components are ineffective). Host activation of virulence gene expression parallels that of Agrobacterium and Rhizobium; the elicitors all appear to be phenolics but are distinct and uniquely active for each pathogen.

DISTRIBUTION OF STREPTOMYCIN RESISTANT (Str^r) STRAINS OF ERWINIA AMYLOVORA AND CONTROL OF FIRE BLIGHT DISEASE IN EGYPT.

EL-GOORANI*, M.A. and EL-KASHEIR, H.M. Department of plant Pathology, Faculty of Agriculture, University of Alexandria, Alexandria, Egypt.

Sudden severe outbreaks of fire blight disease on pears took place at different Governorates from 1982 to present. The use of different copper compounds as sprays during blossom period was not successful in controlling the disease. A small number of growers employed streptomycin sulfate (100-120 µg/ml) during blossom period at 4 day intervals but the results were not conclusive. A preliminary survey of the incidence and occurrence of strains of E. amylovora resistant to streptomycin in certain pear orchards was carried out during May 1986. Isolates of E. amylovora were collected from different orchards with no history of streptomycin use as well as from one orchard in which streptomycin was applied from 1983 to 1986 seasons at the full recommended rate. One isolate out of 88 isolates which were collected from orchards with no history of streptomycin use showed resistance to streptomycin with a minimal inhibitory concentration of about 225 µg/ml. One isolate out of 84 isolates which were collected from the orchard in which streptomycin was applied (1983-1986 seasons) showed resistance to streptomycin with a minimal inhibitory concentration of about 3200 µg/ml. Pathogenicity tests by stab inoculation of green pear fruits showed no considerable variation in virulence among the Str^r and Str^s strains. Morphological and biochemical charateristics were similar in both Str^r and Str^s strains of E. amylovora.

CORROBORATION OF DIFFERENTIAL VIRULENCE OF *ERWINIA AMYLOVORA* TO APPLE, AND EVIDENCE FOR ITS PLASMID-BORNE NATURE

H. S. Aldwinckle*, J. L. Norelli, J.-P. Paulin, Y. Lespinasse and S. V. Beer Cornell University, Geneva, NY 14456 and Ithaca, NY 14853, and I.N.R.A., Angers, France

In the greenhouse apple cv. Evereste was resistant to *Erwinia amylovora* strains Ea266 (Canada), Ea273 (USA), 1430 (France) and 2045 (Fr.); Novole was resistant to Ea273, 1430, and 2045, but susceptible to Ea266, Robusta 5 was resistant to Ea273 and 2045, slightly susceptible to 1430, and susceptible to Ea266. *In vitro* rooted plantlets of Evereste were resistant to strain Ea273, slightly susceptible to 1430 and 2045, and susceptible to Ea266. *In vitro* rooted plantlets of Novole were resistant to strains 2045 and Ea273, slightly susceptible to 1430, and susceptible to Ea266. Significant populations of all 4 strains were recovered from symptomless *in vitro* plantlets of both Evereste and Novole, but populations were generally higher in plantlets with symptoms. These results confirm the existence of differential virulence of *E. amylovora* for *Malus* cvs. They indicate that cv. Evereste may be subject to differential virulence. The French strain 1430 has a certain degree of differential virulence. Ea266 (virulent to Novole) has a 30-kb plasmid, whereas Ea273 and Ea322 (both avirulent to Novole) have a 30-kb and a 60-kb plasmid. A transconjugant of Ea266 containing a Tn5-labeled 60-kb plasmid of Ea322 was avirulent to Novole. When Ea266 was complemented with a library of Ea322 plasmid DNA cloned in pBR322, many clones did not affect virulence of Ea266 to Novole. However a clone containing a 4-kb and a 1.5-kb EcoR1 fragment of the 30-kb plasmid was avirulent to Novole. The 4-kb fragments from Ea273 and Ea266 were cloned in both orientations in the stable, low copy number vector pCPP8. The 4 chimeric plasmids did not affect doubling time of Ea266, nor its virulence to the susceptible cv. Idared. However, Ea266 complemented with any of the four plasmids, but not with the vector alone, was avirulent to Novole.

COMPLEMENTATION FOR PATHOGENICITY OF NONPATHOGENIC TN5-INDUCED MUTANTS OF *ERWINIA AMYLOVORA*. Eva M. Steinberger*, David W. Bauer, and Steven V. Beer. Department of Plant Pathology, Cornell University, Ithaca, NY 14853.

A genomic library of *E. amylovora*, strain Ea321, was constructed in the low-copy number cosmid pCPP9. It was mobilized into Tn5-induced nonpathogenic mutants of Ea321 and Ea322 to identify wild-type sequences complementing for pathogenicity. Approximately 1000 transconjugants per mutant were screened for pathogenic capability by replica transfer onto freshly cut slices of immature pear fruit. Two DNA fragments of 38 kb and 50 kb restored wild-type levels of virulence to two and four mutants, respectively. Restriction mapping revealed that the cosmids contain an overlapping sequence of about 15 kb. Subclones from a 10 kb *Eco*RI fragment of the overlapping region, constructed in the low-copy number plasmid pCPP8, contained at least two genes involved in pathogenicity. Three additional mutants were complemented by another *Eco*RI fragment of approximately 20 kb. Genes involved in pathogenicity are distributed over at least 30 kb of the genome of *E. amylovora*.

ROLE OF ANTIBIOTIC PRODUCTION BY *ERWINIA HERBICOLA* STRAIN EH252 IN THE CONTROL OF FIRE BLIGHT. Joel L. Vanneste*, Lawrence B. Smart, and Steven V. Beer. Department of Plant Pathology, Cornell University, Ithaca, NY 14853.

Strain Eh252 of *E. herbicola* is highly effective in reducing fire blight incidence under orchard conditions and inhibits *E. amylovora*, *in vitro*, by antibiosis. To examine the relationship between these two properties, mutants of Eh252 were produced using a derivative of the bacteriophage lambda as a vector for Tn5. Of 1500 kanamycin resistant strains, three lacked antibiotic activity. For one of these mutants, Southern hybridization using the Tn5-containing plasmid pRZ102 as probe, revealed the presence of a single Tn5-insertion. This mutant and the wild-type strain multiply on apple blossoms at similar rates. Results of tests conducted under controlled environment conditions indicated that the mutant's ability to control apple blossom infection by *E. amylovora* was reduced relative to Eh252. These preliminary data suggest that antibiotic activity is involved in the ability of strain Eh252 to control fire blight.

CHARACTERIZATION OF A PLASMID OF *ERWINIA AMYLOVORA*, Ea322. Eva M. Steinberger* and Steven V. Beer, Department of Plant Pathology, Cornell University, Ithaca, NY 14853.

Several strains of *E. amylovora* harbor two plasmids of ca. 30 kb and ca. 60 kb. Spontaneous loss or curing of the 60 kb plasmid from strain Ea322 did not affect pathogenicity or change the strain's virulence towards apple seedlings or immature pear fruits. But, when a Tn5-labelled derivative of the plasmid (pCPP60.1), was conjugated into strain Ea266, that strain's virulence towards the apple cultivar Novole was eliminated (Aldwinckle, Norelli, Paulin, Lespinasse and Beer; this abstract series). A complete restriction map of pCPP60.1 was constructed using *Eco*RI, *Bam*HI, *Sal*I, and *Xba*I. The site of Tn5 insertion and the size of the indigenous plasmid (57 kb) were determined. The mobilization region of pCPP60.1 was cloned in pUC9-Cm and mapped to a 1 kb sequence delineated by two *Eco*RI sites. Other possible functions of the indigenous plasmid are being investigated with the aid of a complete library of its DNA.

PURIFICATION AND CHARACTERIZATION OF THREE ANTIBIOTICS PRODUCED BY *ERWINIA HERBICOLA* C9-1. C. I. Ishimaru*, E. J. Klos, R. R. Brubaker. Michigan State University, East Lansing, MI 48824.

Erwinia herbicola C9-1 produces three antibiotics *in vitro* which were purified to homogeniety by reverse phase HPLC. These antibiotics were called herbicolin O, I and 2C. Herbicolin O had a broad activity spectrum, whereas herbicolin I and 2C inhibited only *E. amylovora* and *Staphylococcus aureus*. Spontaneous mutants of *E. amylovora* selected for insensitivity to herbicolin I were also insensitive to herbicolin 2C. The activity of herbicolin O was decreased in the presence of L-histidine; herbicolin I and 2C activities were unaffected by histidine. All three herbicolins were base labile and sensitive to beta-lactamase, suggesting that they contained a beta-lactam nucleus. That they contained a novel monocyclic beta-lactam substituted ring was indicated by their UV light absorbance and ^{1}H-NMR spectra. Further analyses indicated herbicolin I consisted of an uncommon amino acid in the N-terminus position followed by valine and had a pseudomolecular ion of $[M + H]^+$ at m/z 317. Significant reductions in disease severity were obtained in immature pear fruit assays when either partially purified herbicolins or cells of *E. herbicola* C9-1 were applied prior to inoculation with *E. amylovora*.

GENETICAL ANALYSIS OF THE PATHOGENICITY OF ERWINIA AMYLOVORA

Jacqueline LAURENT* and Marie-Anne BARNY, Laboratoire de Pathologie Végétale, INRA, 16,rue Cl. Bernard, F-75231 PARIS Cedex 05.

Two approaches have been undertaken to study the determinants of the virulence of *Erwinia amylovora*. Firstly, the strain CFBP 1430 of *E. amylovora* has been cured of pEA, an ubiquitou plasmid of the species, which was present as a unique plasmid in this strain. The cured strain proved virulent. Thus pEA does not play an essential part in the pathogenicity of *E. amylovora*. In the course of this study gene(s) necessary for thiamine biosynthesis have been localized on pEA. Secondly, stable mutants of *Erwinia amylovora* strain CFBP 1430 were obtained by insertion of MuPR13, a defective A^-B^- derivative from bacteriophage Mu. The resulting Cm^r clones were screened on apple calli. Mutants showing altered pathogenicity were isolated. They exhibited a range of phenotypes as regards to their behavior in host and non-host plants. The characterization of these mutants has been undertaken, paying special attention to outer membrane components.

AN EXTRACELLULAR GLUCAN FROM A VIRULENT STRAIN OF ERWINIA AMYLOVORA. Robert A.Rastall*†, Anthony R.W.Smith†, Patrick Blake‡ and Richard C.Hignett‡. †Thames Polytechnic, London SE 18 6PF, England and ‡Institute of Horticultural Research, East Malling, Kent ME 19 6BJ, England.

Under *in vitro* cultural conditions that normally result in the production of extracellular polysaccharide (EPS), a virulent variant of *Erwinia amylovora* strain T, T83, produced a low M_r glucan. The glucan was released as an extracellular complex together with protein and lipopolysaccharide, from which it was released by sequential phenol/water extraction, EDTA treatment, and column chromatography on Sepharose 4B.

The low M_r fraction from the Sepharose 4B column exhibited potent inhibitory activity toward the hypersensitive response (HR) in tobacco. Chromatography of this material on Biogel P2 yielded peaks of the glucan and of four unidentified uv-absorbing species. The purified glucan did not display any HR-inhibiting activity. It is not known at present which of the other components is biologically active.

The glucan was characterized by methylation analysis and NMR spectroscopy (^1H and ^{13}C) as a β1-2 linked glucan containing a β1-2,6 branch residue. The glucan appeared to be an equimolar mixture of penta- and hexasaccharide, and resembled the low M_r glucans concerned with osmotic control that can be recovered from the periplasmic space of other Gram-negative organisms.

In vivo (pear slices), strain T83 produced EPS rather than the glucan. The significance of these results is discussed.

GENE CLUSTER OF *ERWINIA AMYLOVORA* INVOLVED IN PATHOGENICITY AND INDUCTION OF THE HYPERSENSITIVE RESPONSE. David W. Bauer*, Eva M. Steinberger and Steven V. Beer. Department of Plant Pathology, Cornell University, Ithaca, NY 14853.

Two independent, prototrophic Tn5 insertion mutants of *Erwinia amylovora*, Ea321-T102 and Ea322-T101, were identified that are nonpathogenic to immature pear fruits and fail to induce a hypersensitive response (HR) in tobacco leaves. A third nonpathogenic Tn5 insertion mutant, Ea322-T118, has reduced ability to induce an HR in tobacco. Two previously identified naturally occurring nonpathogenic strains, Ea345 and Ea362, also fail to induce the HR. The Tn5-containing *Eco*RI fragment from Ea322-T101 was cloned and used to probe genomic libraries of the wild-type strain Ea322. A recombinant plasmid, pCPP120, weakly restored pathogenicity and the ability to induce an HR to Ea322-T101 and Ea345. A second plasmid, pCPP114, restored pathogenicity and the ability to induce an HR to Ea321-T102, Ea362, and occasionally to Ea345. No plasmid was found that complemented the mutation in Ea322-T118. Restriction mapping showed that the two plasmids overlap by about 2 kb. Functional analysis of subclones from the two plasmids was used to determine the location of the genes on restriction maps of the plasmids. The results revealed a gene cluster that spans a minimum of 12.5 kb and includes at least three transcriptional units.

EVALUATION OF FIREBLIGHT RESISTANCE OF SOMACLONAL VARIANTS INDUCED FROM THE PEAR CULTIVAR "DURONDEAU".

Jacques VISEUR
Faculté des Sciences Agronomiques
Centre de Lutte Intégrée en Phytopathologie (I.R.S.I.A.)
B 5800 Gembloux, Belgium

In vitro regeneration of plantlets was obtained from calluses induced on roots or stems of the pear cv "Durondeau". Regenerated plantlets were micropropagated and their progenies submitted to an early test of resistance toward fireblight caused by Erwinia amylovora.

Plants regenerated from calluses iniated on roots gave 3 clones with a peculiar behaviour when inoculated in vitro with E. amylovora: axillary buds developped from the stem basis of inoculated plantlets, producing shoots which escaped infection.

After micropropagation, in vitro rooting, and adaptation into soil, plants of 2 of the 3 clones had shorter internodes and exhibited slower growth than the third clone and the original cultivar.

When inoculated in the growth chamber with E. amylovora, dwarfed plants exhibited a dry necrosis of the stem immediately after the front of bacterial progress, which stopped before reaching tissues lignified during the previous growth cycle. Healthy shoots developped from axillary buds just below the edge of the necrotic zone.

With cv "Durondeau" controls, necrosis was clearly behind the front of bacterial colonization, extending through vascular tissues down to the basis of the inoculated plants, which were eventually killed.

INVOLVEMENT OF ANTIBIOTICS IN THE MECHANISM BY WHICH *ERWINIA HERBICOLA* INHIBITS *ERWINIA AMYLOVORA*

Richard S. Wodzinski*, Tammy E. Umholtz, Mary Beth Mudgett and Steven V. Beer**. *Biology Dept., Ithaca College, Ithaca, NY, 14850 and **Dept. of Plant Pathology, Cornell University, Ithaca, NY, 14853.

The ability of certain strains of *Erwinia herbicola*, when grown on glucose-asparagine medium, to produce antibiotics that inhibit *E. amylovora* strain Ea273 correlated well with the ability of strains to inhibit the development of fire blight in a research apple orchard. A crude preparation from *E. herbicola* strain Eh318 delayed the development of fire blight symptoms in immature Bartlett pear fruits inoculated with Ea273. No delay in the development of symptoms occurred when pears were inoculated with Ea273R318, a mutant of Ea273 resistant to the antibiotic of Eh318. In addition, Eh318 protected pears from infection by Ea273, but much less protection resulted when pears were inoculated with Ea273R318. Strains Eh318 and Eh252 produce different antibiotics based on stability in acid, the size and clarity of zones of inhibition on lawns of Ea 273, and the phase of growth during which antibiotics are produced. Furthermore, the action of the Eh318 antibiotic is not expressed in the presence of a combination of histidine and arginine, while only histidine precludes expression of the antibiotic produced by Eh252.

FIRE BLIGHT DISEASE: A HYPERSENSITIVE REACTION DELAYED BY ERWINIA AMYLOVORA THROUGH EXCRETION OF (L)-2,5-DIHYDROPHENYLALANINE? A HYPOTHESIS. Gottfried J. Feistner *, Pasarow Analytical Neurochemistry Facility, Dept. Psychiatry and Behavioral Sciences, Stanford Medical Center, Stanford, CA 94305.

Recent results using a pear tissue culture bioassay [E.L. Civerolo et al. (ed) 1987, Plant Pathogenic Bacteria, p. 509-519, Martinus Nijhoff Publishers, Boston] suggested that 2,5-dihydrophenylalanine (DHP), a secondary metabolite from E. amylovora, may be a virulence factor in fire blight disease, but the role of DHP in the disease process is not clear. It seems reasonable to assume that DHP may induce necrosis via enzyme inhibition or other direct toxic actions. However, work involving Nocardia asteroides, an intracellular human pathogen which survives in its host, in part, because it can neutralize reactive oxygen radicals produced by host macrophages, and the observation that DHP is a strong reducing agent which may act in a similar manner, has led the author to also consider the following alternative virulence mechanism. Accordingly, fire blight necrosis may be self-inflicted by rosaceous plants through the so-called "hypersensitive reaction" (HR) which itself is only vagely defined as rapid collapse and death of plant cells, but seems to involve a respiratory burst and possibly also the generation of reactive oxygen radicals. The true role of DHP in fire blight disease might then be the delay of the HR until the bacterium reaches the stationary growth phase and no longer produces DHP, at which time the HR is no longer beneficial but lethal to the plant. This hypothesis relates to other phytobacterial metabolites as well [G. Feistner, in: Z. Klement et al. (ed), Methods in phytobacteriology, Akademiai Kiado, Hungary; in press].

EL FUEGO BACTERIANO

Erwinia amylovora

UN GRAVE PELIGRO PARA NUESTRA FRUTICULTURA

Vista general de una plantación francesa de peral afectada de fuego bacteriano

MINISTERIO DE AGRICULTURA

FIRE BLIGHT LITERATURE RECEIVED DURING 1986 & 1987

(Not listed in USDA Agriculture Handbook 510, the Additional Bibliography or Previous Newsletters)

United States

BACTERIOLOGY

III-241 Janisiewicz, W.J., T. van der Zwet, and P.B. Jahrling. 1986 Laboratory studies on the effect of gamma radiation on Erwinia amylovora survival on apple fruit. Canad. Jour. Microb. 32:(10):787-790.

III-242 Norelli, J.L., H.S. Aldwinckle, and S.V. Beer. 1986 An assay for the virulence of Erwinia amylovora using Malus (Apple) tissue culture. Phytopath. 76:656.

III-243 Lin, C.P., T.A. Chen, J.M. Wells, and T. van der Zwet. 1986 Monoclonal antibodies specific to Erwinia amylovora. Phytopath. 76:564.

III-244 Lin, C.P., T.A. Chen, J.M. Wells, and T. van der Zwet. 1986 Application of monoclonal antibodies in the identification and detection of Erwinia amylovora. Phytopath. 76:1077.

III-245 Lin, C.P., T.A. Chen, J.M. Wells, and T. van der Zwet. 1987 Identification and detection of Erwinia amylovora with monoclonal antibodies. Phytopath. 77:376-380.

III-246 van der Zwet, T., J. Casano, and J.M. Wells. 1986 Changes in fatty acid profiles of Erwinia amylovora due to growth medium and physiological age. Phytopath. 76:1101.

III-247 Casano, F.J., J.M. Wells, and T. van der Zwet. 1987 Effect of growth medium and physiological age on fatty acid analysis of Erwinia amylovora. Acta Hortic. 217:41-42

III-248 Lin, C.P., T.A. Chen, J.M. Wells, and T. van der Zwet. 1987 In vitro and in situ detection of Erwinia amylovora with monoclonal antibodies. Acta Hortic. 217:77-80

III-249 Lin, C.P., T.A. Chen, J.M. Wells, and T. van der Zwet 1987 Direct counts of Erwinia amylovora by immunofluorescent staining with monoclonal antibodies. Acta Hortic. 217:81-86.

III-250 Goodman, R.N., M. Gidley, and D. Butrov. 1987 Structure and proposed mode of action for amylovorin. Acta Hortic. 217:157-160.

III-251 Steinberger, E.M. and S.V. Beer. 1987 Mutants of Erwinia amylovora altered in pathogenicity by transposon mutagenesis. Acta Hortic. 217:167-168.

III-252 Bauer, D.W. and S.V. Beer. 1987 Cloning of Erwinia amylovora DNA involved in pathogenicity and induction of the hypersensitive reaction. Acta Hortic. 217:169-170.

III-253 Vanneste, J.L., J.L. Norelli, D.W. Bauer, and S.V. Beer. 1987 Cloning and restriction map of the recA-like gene of Erwinia amylovora. Acta Hortic. 217:173-174.

III-254 Beer, S.V., J.R. Rundle, and J.L. Norelli. 1987 Orchard evaluation of five strains of Erwinia herbicola for control of blossom infection. Acta Hortic. 217:219.

III-255 Rundle, J.R. and S. V. Beer. 1987 Population dynamics of Erwinia amylovora and a biological control agent, Erwinia herbicola, on apple blossom parts. Acta Hortic. 217:221-222.

III-256 Wodzinski, R.S., T.E. Umholtz, K. Garrett, and S.V. Beer. 1987 Attempts to find the mechanism by which Erwinia herbicola inhibits Erwinia amylovora. Acta Hortic. 217:223-228.

III-257 Wodzinski, R.S., G. Stegner, S.V. Beer, and P. Sobiczewski. 1987 The effect of osmotic concentration of the production of herbicolacin 112Y by Erwinia herbicola 112Y. Acta Hortic. 217:229-233.

III-258 Wodzinski, R.S., S.V. Beer, and P. Sobiczewski. 1987 Survival of an introduced strain and natural populations of Erwinia herbicola on apple. Acta Hortic. 217:245-251.

III-259 Norelli, J.L., H.S. Aldwinckle, and S.V. Beer. 1987 An assay for the virulence of Erwinia amylovora using Malus tissue culture. Acta Hortic. 217:283.

III-260 Bauer, D.W. and S.V. Beer. 1987 Cloning of a gene from Erwinia amylovora involved in induction of hypersensitivity and pathogenicity. Proc. 6th Intern. Conf. Plant Path. Bact. pp. 425-429.

III-261 Steinberger, E.M. and S.V. Beer. 1987 Pathogenicity mutants of Erwinia amylovora caused by TN5 insertion. 6th Intern. Conf. Plant Path. Bact. p. 472.

III-262 Vandenbergh, P.A. and R.L. Cole. 1986 Cloning and expression in Escherichia coli of the polysaccharide depolymerase associated with bacteriophage-infected Erwinia amylovora. Appl. and Envir. Microb. 51(4): 862-864.

III-263 Klopmeyer, M.J. and S.M. Ries. 1987 Effect of Erwinia herbicola on the motility and chemotaxis of Erwinia amylovora. 6th Intern. Conf. Plant Path. Bact. p. 634.

III-264 Hattingh, J.J., S.V. Beer, and J.R. Rundle. 1987 Role of amino acids in biological control of Erwinia amylovora by Erwinia herbicola. 6th Intern. Conf. Plant Path. Bact. p. 922-923.

III-265 Janisiewicz, W.J. and T. van der Zwet. 1987 Effect of two bactericides on Erwinia amylovora survival in vitro and in vivo on apples. Phytopath. 77:987.

III-266 Klopmeyer, M.J. and S.M. Ries. 1987 Motility and chemotaxis of Erwinia herbicola and its effect on Erwinia amylovora. Phytopath.77:909-914.

III-267 Steinberger, E.M. and S.V. Beer. 1987 Characterization of a plasmid of Erwinia amylovora, Ea322. Phytopath. 77:1767.

III-268 Steinberger, E.M., D.W. Bauer, and S.V. Beer. 1987 Complementation for pathogenicity of three TN5-induced mutants of Erwinia amylovora. Phytopath. 77:1696.

III-269 Feistner, G.J. 1987 2.5-Dihydrophenylalanine (DHP) from an axenic culture of Erwinia amylovora: possible cause of fireblight necrosis. Proc. 6th Intern. Conf. Plant Path. Bact. pp. 509-519.

III-270 Goodman, R.N. 1987 Indications of a role for amylovorin as a virulence factor of Erwinia amylovora. Proc. 6th Intern. Conf. Plant Path. Bact. pp. 545-550.

III-271 Wodzinski, R.S., P. Sobiczewski, and S.V. Beer. 1987 Factors affecting production of herbicolacin 112Y by Erwinia herbicola 112Y. Proc. 6th Intern. Conf. Plant Path. Bact. pp. 551-555.

III-272 Kerppola, T.K., T. Serwold-Davis, D.C. Gross, and M.L. Kahn 1987 Effect of increased Beta-glucosidase activity on virulence of Erwinia amylovora. Appl. Environ. Microb. 53:677-682.

III-273 van der Zwet, T., M. Sasser, and J.M. Wells. 1987 Determination of fatty acid profiles relevant to the characterization of Erwinia amylovora. Proc. 6th Int. Conf. Plant Path. Bact. pp. 821-829.

III-274 Goodman, R.N. 1986 Gel formation by the extracellular polysaccharide (EPS) amylovorin produced by Erwinia amylovora and apple cell wall polymers, a basis for xylem vessel occlusion. Phytopath. 76:1118.

III-275 McLaughlin, R.J., J.M. Wells, and T.A. Chen. 1987 Cloning and expression in Escherichia coli of an Erwinia amylovora gene which encodes a species-specific antigen. Phytopath. 77:1616.

III-276 McLaughlin, R.J., J.M. Wells, and T.A. Chen. 1987 Characterization of monoclonal antibodies that are species-specific against Erwinia amylovora antigens. Phytopath. 77:1616-1617.

III-277 Hartung, J.S., D.W. Fulbright, and E.J. Klos. 1988 Cloning of a bacteriophage polysaccharide depolymerase gene and its expression in Erwinia amylovora. Molecular Plant - Microbe Interactions 1:87-93.

III-278 Lindow, S.E. 1987 Competitive exclusion of epiphytic bacteria by ice-pseudomonas syringae mutants. Applied Environ. Microb. 53:2520-2527.

III-279 Casano, F., J. Wells, and T. van der Zwet. 1988 Fatty acid profiles of Erwinia amylovora as influenced by growth medium physiological age and experimental conditions. J. Phytopathol. 121(3): 267-274.

ETIOLOGY

IV-115 van der Zwet, T., S.V. Thomson, R.P. Covey, and W.G. Bonn. 1986 Endophytic Erwinia amylovora not recovered from core tissues of apples from apparently healthy trees. Phytopath. 76:1140.

IV-116 Bayot, R.G. and S.M. Ries. 1986 Role of motility in apple blossom infection by Erwinia amylovora and studies of fire blight control with attractant and repellent compounds. Phytopath. 76:441-445.

IV-117 Hattingh, M.J., S.V. Beer, and E.W. Lawson. 1986 Scanning electron microscopy of apple blossoms colonized by Erwinia amylovora and E. herbicola. Phytopath. 76:900-904.

IV-118 Thomson, S.V. 1986 The role of the stigma in fire blight infections. Phytopath. 76:476-482.

IV-119 Schwager, S.J., S.V. Beer, J.L. Norelli, H.S. Aldwinckle, and T.J. Burr. 1987 Multiple regression analysis of factors associated with the occurrence of blossom infection in the Northeastern United States. Acta Hortic. 217:99.

IV-120 van der Zwet, T., J.C. Walter, and C.P. Lin. 1987 Detection and recovery of Erwinia amylovora in mature pear fruit through monoclonal antibodies. Phytopath. 77:990.

IV-121 Tomasik, A.A. and R.N. Goodman. 1987 Pathogenesis, migration and population dynamics of Erwinia amylovora in susceptible (Jonathan) and resistant (Red Delicious) apple shoots. Proc. 6th Intern. Conf. Plant Path. Bact. pp. 672-679.

IV-122 Steiner, P.W. and R. Heflebower. 1987 Prediction of apple fire blight infections in Maryland, 1984 to 1986. Phytopathology 77:989.

IV-123 Steiner, P.W. and R. Heflebower. 1987 Prediction of apple fire blight overwintering canker activity in Maryland, 1984 to 1986. Phytopathology 77:989-990.

EPIDEMIOLOGY

VI-67 Covey, R.P. 1983 What about fire blight? Proc. Wash. St. Hort. Assoc. 78:171-174.

VI-68 Covey, R.P. 1975 Predicting fireblight goal of Wenatchee research effort. The Goodfruit Grower 26(5):21.

VI-69 Beer, S.V., S.J. Schwager, J.L. Norelli, H.S. Aldwinckle, and T.J. Burr. 1987 Development of a risk-assessment system for fire blight. Proc. 6th Intern. Conf. Plant Path. Bact. pp. 914-916.

VI-70 Jones, A.L. 1987 Evaluation of an in-field microcomputer and a weather-based model for assessing fire blight risk in bloom. Proc. 6th Intern. Conf. Plant Path. Bact., p.973.

VI-71 van der Zwet, T., P. Steiner, J.G. Barrat, K.D. Hickey, and K.S. Yoder. 1987 Development of a blossom blight prediction system for the Appalachian fruit growing region. Acta Hortic. 217:125-132.

HOST NUTRITION

VIII-53 Meyer-Bothling, L.E. and A.L. Karr. 1984 Antibacterial protein(s) in apple. Proceed. Plant Biochem. and Physiol. Symp., Univ. of Mo. v. 3, p. 185.

CHEMICAL CONTROL

IX-275 Norelli, J.L. and T.J. Burr. 1986 Chemical control of fire blight of apple during bloom. APS Fungicide and Nematicide Tests 41:4

IX-276 Shaffer, W.H. and R.N. Goodman. 1985 Appearance of streptomycin-resistant Erwinia amylovora in Missouri apple orchards. Phytopath. 75:1281.

IX-277 Cline, M.N. 1985 Stopping fire blight requires knowing its symptoms and acting promptly. Amer. Nurseryman 161(11):83-88, 93-95.

IX-278 Thomson, S.V. 1986 Methods for evaluating pesticides for control of plant pathogens. Amer. Phytopath. Soc. & Soc. of Nematol. p. 76-78.

IX-279 Beer, S.V. and J.L. Norelli. 1986 Evaluating spray materials to control fire blight: laboratory, greenhouse and field techniques. Amer. Phytopath. Soc. & Soc. of Nematol. p. 134-142.

IX-280 Norelli, J.L. and T.J. Burr. 1987 Chemical control of fire blight of apple during bloom. APS Fungic and Nemat. Tests 42:6.

IX-281 Barrat, J.G. and T. van der Zwet. 1987 Fire blight control trials. Proc. Cumberl.-Shenan. Fruit Work. Conf.

IX-282 Smith, T.J. 1987 Fire blight pear growers' most serious problem. The Goodfruit Grower (March); Vol. 38:27-32.

IX-283 van der Zwet, T. and S.S. Miller. 1988 Controlling fire blight. Amer. Fruit Grower 108 (3): 9,12.

IX-284 Norelli, J.L. and T.J. Burr. 1988 Chemical control of fire blight of apple during bloom. APS Fungic-Nemat. Tests Vol. 43:28.

ERADICATION

X-46 Beer, S.V. and J.R. Rundle. 1987 Disinfestants for treating pruning shears used for fire blight infections. Acta Hortic. 217:243.

HOST RESISTANCE

XI-309 Westwood, M.N. 1982 Rootstocks for pear: pick with care. Amer. Fruit Grower 102(11):26-28.

XI-310 Cummins, J.N. and H.S. Aldwinckle. 1982 New and forthcoming apple rootstocks. Fruit Var. Jour. 36: 66-73.

XI-311 Lamb, R.C., H.S. Aldwinckle, and D.E. Terry. 1985 'Freedom', a disease-resistant apple. HortScience 20: 4, p774-775.

XI-312 Norelli, J.L., H.S. Aldwinckle, and S.V. Beer. 1986 An assay for the virulence of Erwinia amylovora using Malus (Apple) tissue culture. Phytopath. 76:656.

XI-313 Warren, T.D. 1986 The Warren Pear. Pomona Vol. 19(1): 36-37.

XI-314 Preczewski, J. 1986 Fire blight disease: offense is the best defense. Stark Brother Nurseries Bear Facts 6(15):3.

XI-315 Norelli, J.L., H.S. Aldwinckle, and S.V. Beer. 1986 Differential susceptibility of Malus spp. cultivars Robusta 5, and Ottawa 523 to Erwinia amylovora. Plant Disease 70(11):1017-1019.

XI-316 Carlson, R.F. and R.L. Perry. 1986 Mark, apple rootstock. HortScience 21(1-I): 165.

XI-317 Mehlenbacker, S.A. and E.H. Varney. 1987 Fire blight susceptibility of apple introductions and selections. Fruit Var. Jour. 41(1):19-22.

XI-318 Egolf, D.R. 1987 Pyracantha X 'Apache'. Hortscience 22: 173-174.

XI-319 Luby, J.J., D.S. Bedford, E.E. Hoover, S.T. Munson, W.H. Gray, D.K. Wildung, and C. Stushnoff. 1987 'Summercrisp' pear. HortScience 22:964.

XI-320 Egolf, D.R. 1987 'Adirondack' crabapple. HortScience 22:969-970.

XI-321 van der Zwet, T., D. Stankovic, and B. Ristevski. 1987 Collecting Pyrus germplasm in Yugoslavia. HortScience 22:15-21.

XI-322 van der Zwet, T. and S.S. Miller. 1987 Occurrence of severe fire blight in Malling 26 rootstock. Phytopath. 77:990.

XI-323 Sugar, D., P. VanBuskirk, T. van der Zwet, and R. Bell. 1987 Susceptibility of red-fruited pear cultivars to fire blight. Acta Hortic. 217: 285-289.

XI-324 Bell, R.L. and T. van der Zwet. 1987 Fire blight resistance in cultivars and selections of pear and the correlations between measures of resistance. Acta Hortic. 217:291.

XI-325 Bell, R.L. and T. van der Zwet. 1987 Virulence of Erwinia amylovora isolates on Pyrus host clones. HortScience 22:1058.

XI-326 Norelli, J.L., H.S. Aldwinckle, S.V. Beer, and R.C. Lamb. 1987 Evaluation and selection of fire blight resistance in apple with reference to differential virulence in Erwinia amylovora. Acta Hortic. 217:263-264.

XI-327 Norelli, J.L., H.S. Aldwinckle, S.V. Beer, and R.C. Lamb. 1987 The effects of virulence of Erwinia amylovora on the evaluation of fire blight resistance in Malus. Phytopath. 77:1551-1555.

XI-328 Feree, D.C., R.C. Funt, and C.K. Chandler. 1988 Comparison of early performance and fire blight susceptibility of 12 early season apple cultivars. Fruit Var. Jour. 42(1):24-28.

XI-329 Schupp, J.R. and D.C. Ferree. 1988 Annual deblossoming increases fire blight susceptibility of 'Golden Delicious'/M.9 apple trees. Fruit Var. Jour. 42:40-44.

EXTENSION LEAFLETS

EL-82 Bull, C.R. and S.V. Thomson. 1984 Fire blight in commercial orchards. Utah State Coop. Ext. Serv. Leaflet No. 27, 4 pp.

EL-83 Bull, C.R. and S.V. Thomson. 1984 Fire blight of ornamentals. Utah State Coop. Ext. Serv. Leaflet No. 27, 4pp.

EL-84 Pickett, B.S. The blight of apples, pears and quinces. Univ. of Ill. Agric. Exp. Sta. Circ. 172

BOOK CHAPTERS

BC-29 Goodman, R.N. 1983 Fire blight - a case study. Biochem. Plant Pathology, pp. 45-63. John Wiley & Sons.

FOREIGN COUNTRIES

CANADA

XII-A-105 Alberta Agriculture. 1985 Fireblight. Alb. Agr. Garden Fax Sheet, 3pp.

XII-A-106 Granger, R.L. and Y. Groleau. 1986 Rusticite De Poiriers Resistants Au Feu Bacterien. Research Sta. St. Jean sur Rich. (Quebec) Res. Summ. Vol. 15:1-2.

XII-A-107 Quamme, H.A. 1986 Fire blight resistance of several wild pear seedlings collected in southwestern Ontario. Fruit Var. Jour. 40:59-61.

XII-A-108 Bonn, W.G. and D.C. Elfing. 1987 Response of crabapple cultivars to fire blight. Canad. Jour. Plant Path. 9:274.

XII-A-108a Bonn, W.G. and D.C. Elfing. 1986. Response of crabapple cultivars to fire blight, 1985. Amer. Phytopath. Soc. Biol. & Cult. Tests 1:68.

XII-A-108b Bonn, W.G. and D.C. Elfing. 1987 Response of crabapple cultivars to blossom blight caused by Erwinia amylovora. Amer. Phytopath. Soc. Biol & Cult. Tests Vol. 2:61.

XII-A-109 Sholberg, P.L., A.P. Gaunce, and G.R. Owen. 1987 Occurence and elimination of pathogenic Erwinia amylovora on mature fruit in British Colombia. Canad. Jour. Plant. Path. 9:286.

XII-A-110 Kappel, F. and H.A. Quamme. 1987 Processing quality of pear selections in the Harrow Breeding Program. Fruit Var. Jour. 41(4):136-140.

XII-A-111 Bonn, W.G. and J. Warner. 1987 Fire blight susceptibility of scab resistant apple cultivars. Can. J. Plant Pathology 9:252-254.

XII-A-112 Davidson, J.G.N. 1987 The principal diseases of commercial saskatoons. Agric. & Forestry Bull., Alberta Univ., Vol. 10, p. 6-8.

XII-A-113 Bonn, W.G. 1987 Potential for fire blight activity in Ontario. Acta Hortic. 217:101-112.

XII-A-114 Sholberg, P.L. 1988 Evaluation of disinfectants for pruning tools used for fire blight control. APS Fung.-Nemat. Tests Vol. 43:52.

NEW ZEALAND

XII-B-36 Hale, C.N., E.M. McRae, and S.V. Thomson. 1987 Occurrence of Erwinia amylovora on apple fruit in New Zealand. Acta Hortic. 217:33-40.

XII-B-37 Thomson, S.V. and C.N. Hale. 1987 A comparison of fire blight incidence and environment between New Zealand and western United States. Acta Hortic. 217:93-98.

AUSTRALIA

XII-C-5 Wimalajeewa, S.C. and P.J. Sampson. 1987 Post-entry quarantine screening procedures to prevent entry of fire blight into Australia. Acta Hortic. 217:59-61.

NETHERLANDS

XII-F-88 van Teylingen, M. 1981 Bacterievuur: een gevaarlijke planteziekte. Tuin & Landschap 20:17.

XII-F-88a van Teylingen, M. 1981 Bacterievuur over gehele land verspreid. Tuin & Landschap 21:17.

XII-F-89 Stolk, T. 1983 Proefveld bacterievuur in Ouwerkerk - Op weg naar ziekte-analyse, passende bestrijding en resistente rassen. Tuin & Landschap 14:10-12.

XII-F-90 Meijneke, C.A.R. 1985 Bacterievuur - de ontwikkeling van de situatie in 1984. Plant Protect. Serv. Yearb. (1984):92-97.

XII-F-91 Netherlands Ministry of Agriculture and Fisheries. 1984 Bacterievuur wordt harder aangepakt. Min. Agr. & Fish. Pamphlet, 12 pp.

XII-F-92 Netherlands Staatsbosbeheer. 1984. Meidoorn en bacterievuur. Bosbouwvoorlichting 23(3):25-40.

XII-F-93 Maas Geesteranus, H.P. 1985 Wanneer zijn er resultaten te verwachten van de veredeling van peer op resistentie tegen bacterievuur. De Fruitteelt 30:896-897.

XII-F-94 Meijneke, C.A.R. 1986 Bacterievuur - de ontwikkeling in 1985. Neth. Plant Prot. Serv. Yearb. (1985):86-93.

XII-F-95 Scheer, H.A.T. van der. 1987 Biology and control of secondary (or occasionally appearing) diseases on fruit crops. Research Station for Fruit Growing. Ann. Rep. (1985):70.

XII-F-96 Maas Geesteranus, H.P. and J.W.L. van Vuurde. 1986 Bacterievuur by Pomoidae, veroorzaakt door *Erwinia amylovora*. Inst. Phytopath. Res. Ann. Rept. (1985): 21-23.

XII-F-97 Kooistra, T. and J. de Gruyter. 1986 Voortgezet onderzoek naar de chemische bestrijding van bacterievuur. Neth. Plant Prot. Serv. Yearb. (1985): 129-130.

XII-F-98 de Gruyter, J. 1986 Gevoeligheid van *Erwinia amylovora* isolaten voor streptomycine. Neth. Plant Prot. Serv. Yearb. (1985): 131-134.

XII-F-99 Bouma, A.S. 1986 Bcaterievuur vraagt om onderzoek. de Fruitteelt 15:443-445.

XII-F-100 Bouma, A.S. 1986 Bacterievuur vraagt om voortgang onderzoek - schade door ziekte in toekomst te beperken. Tuin & Landschap 7:24-27.

XII-F-101 Bouma, A.S. 1986 Bacterievuur proefveld zal voor de praktijk bruikbare gegevens opleveren. de Plantenbeurs 98(18):3,5.

XII-F-102 Bouma, A.S. 1986 Research on fire blight of pear. Groenten en Fruit 41:(38) 88-89.

XII-F-103 Bouma, A.S. 1987 Bacterievuur vraagt nog meer onderzoek. de Plantenbeurs (Jan. 22):5,7.

XII-F-103a Bouma, A.S. 1987 Bacterievuur vraagt nog meer onderzoek. Groen 43(3): 37-39.

XII-F-104 Bouma, A.S. 1987 Bacterievuur en de liefhebberstuin. Groei & Bloei (Jan.): 7.

XII-F-105 van Teylingen, M. 1987 Bacterievuur. Neth. Plant Prot. Serv. Yearb. (1986):79-84).

XII-F-106 Schouten, H.J. 1987 Confidence intervals for the estimation of the incubation period of fire blight following Billing's Prediction System 1. Neth. Jour. Plant Path. 93:49-53.

XII-F-107 Schouten, H.J. 1987 A revision of Billing's potential doublings table for fire blight prediction. Neth. Jour. Plant Path.93:55-60.

XII-F-108 Bouma, A.S. 1987 Fire blight in the Netherlands. Acta Hortic. 217:53-57.

XII-F-109 Bouma, A.S. 1987 Breeding woody ornamentals for fire blight resistance. Acta Hortic. 217:293-298.

XII-F-110 de Gruyter, J. and T. Kooistra. 1987 Optimalisering van de chemische bestrijding van bacterievuur. Gewasbescherming 18 (5): 149-155.

ENGLAND

XII-G-117 Billing, E. Fire blight - an illustrated field guide. Billing Publ. Memoir 1.

XII-G-118 Cooper, R.M., P. Durrands, D. Youle and D. Longman. Contrasting enzymic strategies of some microbial plant parasites. In: "Natural Antimicrobial Systems" eds. Board & Cooper et al., Univ. of Bath Press.

XII-G-119 Hignett, R.C. and A.L. Roberts. 1985 A possible regulatory function for bacterial outer surface components in fire blight disease. Physiol. Plant Path. 27:235-243.

XII-G-120 European and Mediterranean Plant Protection Organization. 1987 Fire blight in Ireland. Europ. & Medit. Plant Prot. Organ. Rpt. RSE 472.

XII-G-121 European and Mediterranean Plant Protection Organization. 1987 Fire blight in the United Kingdom (Northern Ireland). Europ. & Medit. Plant Prot. Organ. Rpt. RSE 484.

XII-G-121a Food and Agriculture Organisation. 1987 Outbreaks and new records-Ireland fire blight. FAO Plant Prot. Bull. 35 (2):66.

XII-G-122 Billing, E. 1987 Avirulent mutants of _Erwinia amylovora_; relationships between phage sensitivity and biological properties. 6th Intern. Conf. Plant Path. Bact. pp. 617-622.

XII-G-123 Billing, E. 1987 Assessment of fire blight risk assessment systems. 6th Intern. Conf. Plant Path. Bact. pp. 917-921.

XII-G-124 Byrde, R.J.W., J.A. Hutcheon, R.R. Williams, E. Billing, and D.C. Gwynne. 1986 Fireblight at Long Ashton: a case history, 1971-1983. Plant Path. 35(4):417-426.

XII-G-125 Ray, T.C., A.R.W. Smith, K.J. Carter, and R.C. Hignett. 1986 Composition of lipopolysaccharides from four strains of _Erwinia amylovora_. Jour. Gen. Microb. 132:3159-3167.

XII-G-126 Garrett, C.M.E., P.S. Blake, D.A. Fletcher, and D.J. Austin. 1987 Preliminary discrimination of _Erwinia amylovora_ strains by fatty acid profiling. Acta Hortic. 217:63-69.

XII-G-127 Cooper, R.M. and D. Youle. 1987 Possible determinants of pathogenicity of _Erwinia amylovora_; evidence for an induced toxin. Acta Hortic. 217:161-166.

XII-G-128 Sigee, D.C. and M.H. El-Masry. 1987 The release and electron microscope visualization of plasmids in _Erwinia amylovora_ using an in situ lysis technique. Acta Hortic. 217:183-188.

XII-G-129 Wilson, M., H. Epton, and D. Sigee. 1987 Ultrastructural studies on fire blight of hawthorn flowers. Acta Hortic. 217:189-194.

XII-G-130 Jones, D.R. and R.J.W. Byrde. 1987 Chemical control of fire blight on cider apple, 1985. Acta Hortic. 217:235-238.

XII-G-131 Ray, T.C., A.R. Smith, R. Wait, and R.C. Hignett. 1987 Structure of the sidechain of lipopolysaccharide from _Erwinia amylovora_. Eur. Jour. Biochem. 170: 357-362.

XII-G-132 Hignett, R.C. 1987 Inhibition of fireblight disease by injection of D-galactose of L-fucose into susceptible apple plants. Physiol. Molecular Plant Path. 30(1):131-138.

SWEDEN

XII-J-9 European and Mediterranean Plant Protection Organization. 1987 Outbreak of fire blight in Sweden in 1986. Europ & Medit. Plant Prot. Organ. Rpt. RSE 477.

NORWAY

XII-K-2 European and Mediterranean Plant Protection Organization. 1986 Fire blight in Norway. Europ. & Medit. Plant Prot. Organ. Rpt. RSE 471.

XII-K-3 Sletten, A. 1987 Utbrudd av paerebrann i Norge. Aktuelt fra Statens Fagtjeneste for Landbruket No. 4:305-307.

XII-K-4 Norwegian Plant Protection Service. Paerebrann. 1987 Statens Plantevern en Planteinspeksjon Leaflet.

XII-K-5 Sletten, A. 1987 Paerebrann i landet. (Fire blight in the country) Norsk Hagetidend 103(4):229-230.

XII-K-6 Sletten, A. 1987 Paerebrann (Fire blight). Statens Fagtjeneste for Landbruket Smaskrift 2/87, 8 pp.

XII-K-7 Food and Agriculture Organization. 1987 Outbreaks and new records Norway fire blight. FAO Plant Prot. Bull. 35(2):68

WEST GERMANY

XII-L-157 Isenbeck, M. and F.A. Schulz. 1985 Biological control of fireblight *Erwinia amylovora* on ornamentals I. Control of the pathogen by antagonistic bacteria. Phytopath. Zeitsch. 113(4): 324-333.

XII-L-158 Zeller, W. 1986 *Cotoneaster waterei* - Indikatorpflanze zum Feuerbrandvorkommen. Deutsche Baumschule 4: 158-159.

XII-L-159 Zeller, W. 1984 Zum stand der chemischen bekaempfung der Feuerbrandkrankheit in der Bundesrepublik Deutschland. Gaertnerboerse und Gartenwelt 17: 404-405.

XII-L-160 Zeller, W. 1986 Untersuchungen zur Desinfektion des Feuerbranderregers (*Erwinia amylovora*) an Veredlungsreisern und Birnengewebe. Gesunde Pflanzen 38:23-28.

XII-L-161 Graf, H. and L.H. Baumm. 1986 Stand der Feuerbrand entwicklung im Niederelbegebiet 1985. Erwerbsobstbau 72-81.

XII-L-162 Knosel, D. 1986 Direct detection of the fireblight pathogen *Erwinia amylovora* by the pear test using membrane filtration. Nachricht. Deutsch. Pflanzensch. 38:81-83.

XII-L-163 Michel, H.G. 1987 Der Feuerbrand gefahrdet Obst- und Ziergeholze. Merkblatt, Pflanzenschutzdienst Baden-Wurtemberg.

XII-L-165 Isenbeck, M. and F.A. Schulz. 1986 Biological control of fireblight (*Erwinia amylovora*) on ornamentals. II. Investigation about the mode of action of the antagonistic bacteria. Phytopath. Zeitsch. 116(4):308-314.

XII-L-166 Zeller, W. and W. Brulez. 1987 Changes in the phenol-metabolism of ornamentals infected by *Erwinia amylovora*. 6th Intern. Conf. Plant Path. Bact. pp. 686-694.

XII-L-167 Persiel, F. and W. Zeller. 1987 Die Widerstandsfahigkeit wachsender Cotoneaster-Arten gegen die Feuerbrand-krankheit. Baumschulpraxis 17:215.

XII-L-168 Zeller, W. and M. Jost. 1987 Anheitung zum Monitoring des Feuerbranderregers (*Erwinia amylovora*) Nachricht. Deutsch. Pflanzensch. 39:177-178.

EAST GERMANY

XII-M-27 Ehrig, F., R. Zielke, and U. Siebert. 1984 Use of the colloidal gold technique for the immune electron microscopic identification of phytopathogenic bacteria. Arch. Phytopath. und Pflanzensch. 20(6): 513-516.

XII-M-28 Nachtigall, M., W. Ficke, and H.J. Schaefer. 1985 Model trials on the viability of _Erwinia amylovora_. Arch. Phytopath. und Pflanzensch. 21(6):455.

XII-M-29 Richter, K. and H.J. Schaefer. 1985 _Amelanchier ovalis_ Med.-anfallig fur Feuerbrand. Nachricht. Pflanzenschutz DDR 39:253-254.

XII-M-30 Ehrig, F. and W. Ficke. 1986 Scanning electron microscopic investigations on the hibernation of _Erwinia amylovora_ in plant tissue. Arch. Phytopath. und Pflanzenschutz 22(2):163-166.

XII-M-31 Ficke, W. and E. Peter. 1986 Movement of _Erwinia amylovora_ in apple tissue. Arch. Phytopath. und Pflanzenschutz 22(5):395-400.

XII-M-32 Nachtigall, M., W. Ficke, and H.J. Schaefer. 1986 Fireblight control on apples by pruning measures. Gartenbau 33(7): 7-8.

XII-M-33 Nachtigall, M. and A. Krause. 1987 Effective disinfectants against _Erwinia amylovora_. Arch. Phytopath. und Pflanzensch. 23(1):31-41.

XII-M-34 Zielke, R. and W. Ficke. 1987 Untersuchungen uber die Eignung des Elisa zum Nachweis von _Erwinia amylovora_. Arch. Phytopath. Pflanzensch. 23:349-359.

XII-M-35 Ficke, W., H.J. Schaefer, and M. Nachtigall. 1986 Empfehlungen zur Durchfuhrung des Gesundungsschnittes bei der Bekampfung des Feuerbrandes in Apfelertragsanlagen. Nachrich. Pflanzenschutz DDR 40:247-251.

XII-M-36 Zielke, R. and W. Ficke. 1987 Anwendung des ELISA beim Nachweis des Feuerbranderregers in Obstanlagen. Nachrich. Pflanzenschutz DDR 41:191-193.

XII-M-37 Kleinhempel H. and M. Nachtigall. 1987 Disinfection of pruning shears for the prevention of the fire blight transmission. Acta Hortic. 217:211-218.

XII-M-38 Ehrig, F., W. Ficke, & M. Nachtigall. 1987 Scanning electron microscopy used to examine the development of bacterial strands of _Erwinia amylovora_. Arch. Phytopath. Pflanzenschutz 23(6):509-512.

XII-M-39 Ehrig, F. and W. Ficke. 1987 Scanning electron microscopic determination of the period between artificial infection of apple shoots with _Erwinia amylovora_ and the development of exudate. Arch. Phytopath. Pflanzensch. 23(6):505-508.

AUSTRIA

XII-N-2 Keck, M. 1984 Possibilities for identifying the fireblight pathogen _Erwinia amylovora_ at the federal Institute for Plant Protection, Vienna. Pflanzenarzt 37(10):153-154.

XII-N-3 Keck, M. 1985 On the probability of the appearance of fireblight in Austria. Pflanzenschutz 6:5-6.

XII-N-4 Keck, M. 1986 First investigations of fireblight suspected plant material in Austria. Pflanzenschutzberichte 47(3):44-45.

XII-N-5 Fiebinger, H. 1986 Fireblight host plants which are used as ground cover. Pflanzenschutz 7:7-8.

XII-N-6 Keck, M., R. Grimm, and E. Lex. 1987 Der Feuerbrand - Thema einer kunftigen Zusammenarbeit zwischen den Landern Schweiz und Oesterreich. Pflanzenschutz Nr. 9-10:24-25.

XII-N-7 Keck, M. and W. Wittman. 1985 Feuerbranduntersuchungen von Geholzen an Autobahnen. Pflanzenschutz 11:3.

XII-N-8 Keck, M. and W. Wittman. 1987 Feuerbrand - Kontroll untersuchungen 1986. Pflanzenschutz 2:10-11.

XII-N-9 Keck, M., R. Grimm, and E. Lex. 1987 Der Feuerbrand - eine latente Gefahr fur den Kernobstbau der Schweiz und Osterreichs. Besseres Obst. 8:186-187.

SWITZERLAND

XII-O-42 Swiss Federal Research Station for Fruit Growing. 1985 Der Feuerbrand - le feu bacterien - Colpo di fuoco batterico. Eidg. Forschunganst. Obst., Wein und Gartenbau Pamphlet, 7 pp.

XII-O-43 Anonymous. 1985 Feuerbrand heute: eine gefahrliche krankheit kommt naher. Schweizer Garten No. 12:18-21.

XII-O-44 Pflanzenschutzinspektorat Eidg. Forschungsanstalt. 1985 Import ban on host plants of fire blight remains. Schweiz. Zeitsch. Obst. und Weinbau 121(10):315.

XII-O-45 Grimm, R. 1986 The fireblight situation at the end of 1985. Schweiz. Zeitsch. Obst. und Weinbau 122(10):292-295.

XII-O-46 Grimm, R. 1987 No fire blight in Switzerland yet, but measures have been taken against the disease. Acta Hortic. 217:21-22.

XII-O-47 Grimm, R., W. Zeller and T. van der Zwet. 1986 Feuerbrand: Verbreitung 1985, Erkennung und Bekampfung der Krankheit. Forstw. Recherche Agron. Suisse 25:15-23.

XII-O-48 Grimm, R. 1986 Feuerbrand 40 km sudlich von Genf. Eidg. Forschunganst. Wadenswil, Leaflet.

XII-O-49 Grimm, R. 1987 Feuerbrand - bakterielle Gefahr fur Kernobstbaume. Neue Zurcher Zeitung, Forschung und Technik. NZZ Nr. 88: 67-68.

POLAND

XII-P-15 Sobiczewski, P. and D.F. Millikan. 1985 Efficacy of chemicals for control of fire blight (Erwinia amylovora). Fruit Sci. Rept. 12(1):27-34.

XII-P-16 Sobiczewski P. and S. Berczynski. 1985 New possibilities of the control of bacterial diseases of fruit trees. Sad Nowoczesny 5:9-12.

XII-P-17 Sobiczewski, P. and L. Piotrowicz. 1985 Fire blight forecasting. Postepy Nauk Rolniczych 32(5):91-100.

XII-P-18 Sobiczewski, P., S. Berczynski and L. Piotrowicz. 1985 Can we forecast the occurrence of fire blight? Ochrona Roslin 6:18-21.

XII-P-19 Sobiczewski, P. 1985 Fire Blight - III International. Ochrona Roslin 4:13-15.

XII-P-20 Wodzinski, R. 1985 Nowy model prognozowania wystepowania zarazy ogniowej na jabloniach. Ochrona Roslin 6:21-22.

XII-P-21 Sobiczewski, P. 1986 A present-day approach to fire blight in Poland. Ochrona Roslin 3:13-15.

XII-P-22 Sobiczewski, P. 1986 Epidemiology and control of fire blight. Materialy z Naukowo-Technicznej Konferencji w Bialej Podlaskiej 16(05):55-69.

XII-P-23 Sobiczewski, P. 1986 Co nowego w sprawie zarazy ogniowej. Prace Inst. Sad. i Kwiaciarstwa, Seria C. Nr 3-4/ 91-92:29-32.

XII-P-24 Sobiczewski P., S. Berczynski, and L. Piotrowcz. 1987 Weather analysis with Billing's system and fire blight occurrence in Poland. Acta Hortic. 217:113-118.

XII-P-25 Sobiczewski, P. 1987 IV Miedzynarodowa Konferencja na temat zarazy ogniowej. Ochrona Roslin 4:8-10.

FRANCE

XII-Q-121 Pochon, I. and P. Lecomte. Susceptibility to fireblight of the most important apple rootstocks and of some quince rootstocks. Hortic. Franc. 175:8-11.

XII-Q-122 Vanneste, J., J.P. Paulin, M. Duron, A. Kotoujansky, and A. Coleno. 1985 Recherche des determinants genetiques du pouvoi pathogene chez Erwinia amylovora. Agronomie 5(1):87-88.

XII-Q-123 Mesnil, G. 1985 What is to be done in the face of the danger of pear bacterial blight? Rev. Hort. 257:p33, 36-37.

XII-Q-124 Gardan, L., C. Manceau, and J.P. Paulin. 1985 Mise au point sur les effets des traitements antibiotiques contre les maladies bacteriennes des plantes. Prem. Jour. d'Etud. Malad. Plantes Tome 2:445-452.

XII-Q-125 Paulin, J.P., P. Balavoine, H. Boue, and P. Larue. 1985 Efficacite experimentale de produits destines a lat lutte contre le feu bacterien. Prem. Jour. d'Etud. Malad. Plantes Tome 2:453-460.

XII-Q-126 Pauline J.P. and P. LeComte. 1985 Susceptibility of flower buds of pear trees to infection by Erwinia amylovora. Soc. Franc. Phytopath. 28:174-176.

XII-Q-127 Paulin, J.P., C. Jacquart-Romon, and D. Payen. 1985 Fire blight of pear trees: tentative evaluation of climatic risks during blossom period. Soc. Franc. Phytopath. 28:183-187.

XII-Q-128 Institut Nationale de la Recherche Agronomique. 1985 Feu bacterien du poirier, du pommier et pomoidees ornementales. Inst. Nat. Rech. Agron. Leaflet.

XII-Q-129 Le Lezec, M., B. Thibault, P. Balavoine, and J.P. Paulin. 1985 Sensibilite varietale du pommier et du poirer au feu bacterien. Aboric. Fruit. 372:19-26.

XII-Q-130 Le Lezec, M., K. Babin, and P. Lecomte. 1986 Susceptibility of American and European apple varieties to fire blight. Aboric. Fruit. 33(388):23-31.

XII-Q-131 Vanneste, J. 1987 Phage Mu as a genetic tool to study the pathogenicity of Erwinia amylovora. Proc. 6th Intern. Conf. Plant Path. Bact. p. 430-433.

XII-Q-133 Boue, H. and C. Chaffurin. 1986 Feu bacterien: le point en Aquitaine. Fruits et Legumes (Janvier):36-39.

XII-Q-134 Paulin, J.P. and M. Duron. 1986 Identification of pathogenic strains of Erwinia amylovora by innoculation of root calluses of Malus Domestica, 'Golden Delicious'. Agronomie 6(9):869-872.

XII-Q-135 Dizengremel, M.N., J.C. Foucard, and C. Bigot. 1986 Preliminary trials on the in vitro propagation of some species intended to replace ornamental Pomoideae susceptible to fire blight. Rev. Hort. 264:13-23.

XII-Q-136 Paulin, J.P. 1987 Susceptibility to *Erwinia amylovora* of flower buds of pear trees under natural conditions. Proc. 6th Intern. Conf. Plant Path. Bact. pp. 623-627.

XII-Q-137 Lachaud, G., B. Foncelle, J. Riom, D. Guyon, and J.P. Paulin. 1987 Infrared photography and video technique for visualization of fire blight internal lesions. Acta Hortic. 217:87-91.

XII-Q-138 Jacquart-Romon, C., J.P. Paulin, and D. Payen. 1987 A computer program based on Billing's system I for timing of control measures against fire blight. Acta Hortic. 217:119-123.

XII-Q-139 Cadic, A., F. Lemaire, and J.P. Paulin. 1987 Nitrogen nutrition and susceptibility to fire blight (*Erwinia amylovora*) of pyracantha cv. Mohave: a preliminary study using an hydroponic system. Acta Hortic. 217:149-155.

XII-Q-140 Laurent, J., M.A. Barney, & A. Kotoujansky. 1987 Obtention of a strain of *Erwinia amylovora* cured of its plasmid pEA. Acta Hortic. 217:171.

XII-Q-141 Vanneste, J.L., J.P. Paulin, and D. Expert. 1987 Use of the Mu bacteriophage derivative to construct mutants of *Erwinia amylovora* altered in pathogenicity. Acta Hortic. 217:179-182.

XII-Q-142 Manceau, C., J.P. Paulin, and L. Gardan. 1987 The use of antibiotics to control fire blight in France: environmental hazards and established legislation. Acta Hortic. 217:195-202.

XII-Q-143 Paulin, J.P., G. Lachaud, and R. Chartier. 1987 Results of spray experiments on the control of fire blight. Acta Hortic. 217:239-242.

XII-Q-144 Paulin, J.P. and Y. Lespinasse. 1987 Evaluation with different isolates of *Erwinia amylovora* of the susceptibility to fire blight of apple cultivars. Acta Hortic. 217:253-261.

XII-Q-145 Thibault, B., P. Lecomte, L. Hermann, and A. Belouin. 1987 Comparison between two methods of selection for resistance to *Erwinia amylovora* in young seedlings of pear. Acta Hortic. 217:265-272.

XII-Q-146 Cadic, A. 1987 Breeding pyracantha for fire blight resistance. Acta Hortic. 217:299-303.

XII-Q-147 Thibault, B., P. Lecomte, L. Hermann, and A. Belouin. 1987 Assessment of the susceptibility to *Erwinia amylovora* of 90 varieties or selections of pear. Acta Hortic. 217:305-309.

XII-Q-148 Le Lezec, M., J.P. Paulin, and P. Lecomte. 1987 Shoot and blossom susceptibility to fire blight of apple cultivars. Acta Hortic. 217:311-315.

XII-Q-149 Duron, M., J.P. Paulin, and M.N. Brisset. 1987 The use of *in vitro* propagated plant material for rating fire blight susceptibility. Acta Hortic. 217:317-324.

XII-Q-150 Laurent, J., J.P. Paulin, and J. Zucca. 1987 Ultrastructural study of *Erwinia amylovora* strains: effect of culture conditions and fixation procedures. Protoplasma 139:1, p. 1-8.

XII-Q-151 Paulin, J.P. 1987 Realisations recentes de la recherche sur le feu bacterien. OEPP/EPPO Bulletin 17:177-188.

XII-Q-152 Lecomte, P. and I. Palazon. 1987 Fuego bacteriano: situacion actual de los focos en Fancia y avances en su control. Frutic. Prof. 9:23-24.

XII-Q-153 Aldwinckle, H.S., J.P. Paulin, Y. Lespinasse, and M. Duron. 1987 Virulence d'Erwinia amylovora sur quelques variettes de Pommier in vitro et en serre. 32eme Colloque Soc. Franc. Path. 14-15 Mai 1987.

XII-Q-154 Mendoza A. and J.P. Paulin. 1987 Variabilite de l'agressivite chez Erwinia amylovora. ler Congres Soc. Franc. Path. 19-20 Novembre, Rennes.

XII-Q-155 Paulin, J.P., Y. Lespinasse, G. Lachaud, and H.S.Aldwinckle. 1987 Interaction souches-variettes dans le cas du feu bacterien du Pommier. ler Congres Soc. Franc. Path. 19-20 Novembre, Rennes.

BELGIUM

XII-R-48 Vlachakis, J. and M. Verhoyen. 1984 Isolation of Erwinia amylovora bacteriophages to control pear fireblight. Meded. Fac. Landbouww. Rijksuniv. (Gent) 36(2):551-558.

XII-R-49 Vantomme, R., C. Rijckaert, L. Verdonck, J. Mergaert, J. Swings, and J. De Ley. 1984 Identification of Erwinia amylovora. Revue De L'Agriculture 37(5):1157-1161.

XII-R-50 Van Vaernbergh, J. 1984 Survival and detection of causal Erwinia amylovora on leaf surfaces. Meded. Fac. Landbouww. Rijksuniv. (Gent)49(2b):535-550.

XII-R-51 De Wael, L., O. Van Laere, and M. De Greef. 1984 Toxicity of the bactericide "MBR 10995" for honeybees. Revue de L'Agric. 37(5):1163-1166.

XII-R-52 de Coster, J. 1986 Fire blight severe in Belgium pears. Great Lakes Fruit Grow. News 25(3):62.

XII-R-53 Timmermans, Y., M. Laroche, and T. Deckers. 1984 Fireblight of Rosaceae in Belgium from 1982 to 1984: applicability of the Billing systems in two pear orchards. Parasitica 40(4):221-232.

XII-R-54 Laroche, M. and M. Verhoyen. 1984 1984 Adaptation and application of the Elisa test, indirect method, to the detection of Erwinia amylovora. Parasitica 40(4): 197-210.

XII-R-55 Van Vaerenbergh, J. 1984 Survival and detection of casusal Erwinia amylovora on leaf surfaces. Meded. Fac. Landbouww. Rijksuniv. (Gent) 36(2): 535-550.

XII-R-56 Van Laere, O., L. De Wael, and J. De Mey. 1985 Immuno gold staining (IGS) and immuno gold silver staining (IGSS) for the identification of the plant pathogenic bacterium Erwinia amylovora. Histochemistry 83:397-399.

XII-R-57 Laroche, M. and M. Verhoyen. 1986 The search for a specific antigen for Erwinia amylovora. Jour. Phytopath. 116(3): 269-277.

XII-R-58 Vantomme, R., C. Rijckaert, J. Swings, and J. De Ley. 1986 Characterization of further Erwinia amylovora strains and the application of the API 20E system in diagnosis. Jour. Phytopath. 117(1): 34-42.

XII-R-59 LaRoche, M. 1987 The search for a specific antigen on Erwinia amylovora. Proc. 6th Intern. Conf. Plant Path. Bact. p 877.

XII-R-60 Timmermans, Y. and M. Laroche. 1987 Epidemiological survey of fire blight development in Belgium. Acta Hortic. 217:133-142.

XII-R-61 Hutschemackers, J., M. Verhoyen, and H. Bazin. 1987 Production of rat monoclonal antibodies specific to _Erwinia amylovora_. Acta Hortic. 217:71-76.

XII-R-62 Vanneste, J.L., O. Expert, and M. Faelen. 1987 Evidence that derivatives of the bacteriophage Mu can be used as genetic tools in _Erwinia amylovora_. Acta Hortic. 217:175-177.

XII-R-63 Deckers, T. and W. Porreye. 1987 Primary inoculum formation of _Erwinia amylovora_. Acta Hortic. 217:143-144.

XII-R-64 Laroche, M., G. Givron, and M. Verhoyen. 1987 Specific identification of _Erwinia amylovora_ through their metabolites. Acta Hortic. 217:43-51.

XII-R-65 Deckers, T., J. Greenen, and W. Porreye. 1987 Strategy for fire blight control under natural infection conditions. Acta Hortic. 217:203-210.

XII-R-66 Viseur, J., and M. Tapia y Figueroa. 1987 _In vitro_ co-culture as a tool for the evaluation of fire blight resistance in pears and apples. Acta Hortic. 217:273-282.

ITALY

XII-T-37 Bazzi, C. and U. Mazzucchi. 1986 Fireblight: a permanent threat. Inform. Fitopat. 36(12):27-34.

RUSSIA

XIII-A-37 Kalinichenko, G.V. and R.I. Kalinichenko. 1983 Aspects of fruit production in pear in the crimea following infection with bacterial disease. Sel Skokhoz. Biol. 4:68-71.

ISRAEL

XIII-C-1 European and Mediterranean Plant Protection Organization 1985 Appearance of _Erwinia amylovora_ in Israel. Europ. & Medit. Plant Prot. Organ. Rpt. RSE 459.

XIII-C-2 Food and Agriculture Organization. 1986 Outbreaks and new records: Israel, appearance of _Erwinia amylovora_ in Israel. Plant Protect. Bull. 34(1):65.

XIII-C-3 Zutra, D. and E. Shabi. 1985 First evidence of fire blight in Israel. Phytoparasitica 13(2):151.

XIII-C-4 Shabi, E. and D. Zutra. 1987 Outbreaks of fire blight in Israel in 1985 and 1986. Acta Hortic. 217:23-31.

XIII-C-5 Zutra, D., E. Shabi, and G. Lazarovits. 1986 Fire blight on pear, a new disease in Israel. Plant Disease 70(11):1071-1073.

XIII-C-6 Bashan, Y. 1987 Mechanisms of symptom production by foliar bacterial pathogens. Phytoparasitica 15(3):197-224.

XIII-C-7 Beer, S.V., E. Shabi, and D. Zutra. 1986 Fireblight in Israel - 1985. Observations and recommendations. EPPO Bull. 16(4):639-645.

EGYPT

XIII-E-13 European and Mediterranean Plant Protection Organization. 1986 Fire blight in Egypt. Europ. & Medit. Plant Prot. Organ. Rpt. RSE 467.

XIII-E-14 Abo-El-Dahab, M.K., M.A. El-Goorani, A.A. Shoeib, and W. Zeller. 1985 Zur feuerbrand-situation in Agypten und vergleichende untersuchungen zur taxonomie von _Erwinia amylovora_. Gesunde Pflanzen. 37:189-194.

XIII-E-15 van der Zwet, T. 1986 Identification, symptomatology, and epidemiology of fire blight on 'Le Conte' pear in the Nile Delta of Egypt. Plant Disease 70(3): 230-234.

XIII-E-16 Shoeib, A.A., W. Zeller, M.K. Abo-El-Dahab, and M.A. El-Goorani. 1987 Taxonomic studies on Erwinia amylovora and its sensitivity to antibiotics. Proc. 6th Intern. Conf. Plant Path. Bact. p830-834.

MEXICO

XIII-L-5 Mendoza, A. and D. Teliz. 1987 Behavior of Erwinia amylovora on low-chilling pears in the central region of Mexico. Acta Hortic. 217:145-148.

GREECE

XIII-V-2 European and Mediterranean Plant Protection Organization. 1987 Fire blight outbreaks in certain Greek Islands. Europ. & Mediter. Plant Prot. Organ. Rpt. RSE 476.

CYPRUS

XIII-W-1 Food and Agriculture Organization. 1985 Outbreak of pests and diseases. Cyprus. Appearance of Erwinia amylovora. FAO Asia and Pacif. Plant Prot. Comm. Quart. Newsl. 28(2):4.

XIII-W-2 European and Mediterranean Plant Protection Organization. 1985 Appearance of Erwinia amylovora in Cyprus. Europ. & Medit. Plant Prot. Organ. Rpt. RSE 457.

XIII-W-3 Dimova, Maria. 1986 Bakteriako kapsimo. ISBN 9963-1-0116-X, Nicosia, 4 pp.

XIII-W-4 Psallidas, P.G. and M. Dimova. 1986 Occurence of the disease Fire-blight of Pomaceous trees in Cyprus. Characteristics of the pathogen Erwinia amylovora. Annls. Inst. Phytopath. Benaki, (N.S.) vol. 15, 61-70.

LIST OF PERSONS INTERESTED IN FIRE BLIGHT [1/]

Abo-El-Dahab, M. K., Plant Pathology Dept., Faculty of Agric., Univ. of Alexandria, Alexandria, Egypt (71960)	(1)	EGY
Agriculture Canada, Library Records Division, Ottawa, Ontario K1A 0C5, Canada	(2)	CND
Aldwinckle, H. S., Department of Plant Pathology, N.Y. State Agric. Expt. Station, Geneva, New York 14456. (315-787-2331)	(1)	USA
Alston, F. H., Fruit Breeding Department, Inst. of Hortic. Research, East Malling, Maidstone, Kent, ME19 6BJ, England. (0732-843833)	(1)	UK
Anderson, H., The Government Plant Protection Service, Gersonsvej 13, 2900 Hellerup, Denmark. (01-620787)	(1)	DK
Arsenijevic, M., Faculty of Agriculture, Institute for Plant Prot., V. Vlakovica 2, 21000 Novi Sad, Yugoslavia. (021-58-366)	(3)	YUG
Balavoine, P., Service de la Protection des Vegetaux, Direc. Dept. Agric. et de la Foret, 7 Avenue de Lyon, 73018 Chambery Cedex, France (79-690545)	(1)	FR
Bates, J. J., Biological Research Center, Imperial Chemicals Inc., P.O. Box 208, Goldsboro, North Carolina 27530. (919-736-3030)	(2)	USA
Baumm, L. H., Institute fur Angewandte Botanik, Univ. of Hamburg, Marseillerstrasse 7, 2000 Hamburg 36, West Germany (040/41232359)	(1)	BRD
Baykal, N., Agric. Univ., Ziraat Fakultesi, Fitopatoloji Kursusu, Ankara, Turkey.	(3)	TUR
Bazzi, C., Laboratorio Fitobatteriologia, Istituto Patol. Vegetale, via Filippo Re 8, 40126 Bologna, Italy. (051-244218)	(3)	ITA
Beer, S. V., Department of Plant Pathology, Cornell University, Ithaca, New York 14853. (607-255-7870)	(1)	USA

1/ Names underlined are contact persons for preparation of fire blight newsletter. Numbers in parentheses following addresses are local telephone numbers, and those in column at right indicate activity or interest in fire blight:

1. Actively engaged in fire blight research;
2. Indirectly interested in fire blight;
3. Interested in fire blight, but located in region where disease is not present;
4. Retired but still interested in fire blight activities.

Bell, R. L., U. S. Department of Agriculture, Appalachian Fruit Research Station, Rt. 2, Box 45, Kearneysville, West Virginia 25430. (304-725-3451, ext 53)	(1)	USA
Benjama, A., Station Regionale de Phytiatrie, Institut Nationale de la Recherche Agronomique, B. P. S 40, Meknes, Morocco.	(3)	MOR
Bergna, D. A., Estacion Experimental Alto Valle, Casilla de Correo 52, 8332 General Roca, Rio Negro, Argentina. (0941-25017)	(3)	ARG
Beutel, J. A., Department of Pomology, University of California, Davis, Calif. 95616. (916-752-0507)	(1)	USA
Biehn, W., R & D Agric. Div., Ciba Geigy Corporation, Box 18300, Greensboro, North Carolina 27419.	(2)	USA
Biggs, A. R., Agriculture Canada, Research Station, Vineland Station, Ontario LOR 2EO (416-562-4113)	(2)	CND
Billing, Eve, 4 Fromandez Drive, Horsmonden, Tonbridge, Kent TN12 8LN, England (089-272-2807)	(4)	UK
Bolay, A., Section de Phytopathologie, Station Federale de Recherches Agronomiques de Changins, 1260 Nyon, Switzerland. (022-615451)	(3)	SWT
Bonn, W. G., Agriculture Canada, Research Station, Harrow, Ontario NOR 1GO, Canada. (519-738-2251)	(1)	CND
Bouma, A. Sophieke, Research Station for Nursery Stock and Urban Greenery, P.O. Box 118, 2770 AC Boskoop, The Netherlands, (01727-3220).	(1)	NL
Braum, P. G., Agriculture Canada Research Station, Kentville, Nova Scotia, B4N 1J5, Canada. (902-678-2171)	(2)	CND
Bredemeier, D., Universidade Federal de Santa Maria, Departamento de Fitotecnia, 97-100 Santa Maria, Rio Grande do Sul, Brazil.	(3)	BRA
Burkowicz, A., Instytut Sadownictwa, 83-111 Milobadz, Poland.	(2)	POL
Bushong, J. W., Agrichemicals Div., 3M Center, Bldg 225-5N, 3M Company, St. Paul, Minnesota 55144 (612-733-4758)	(2)	USA
Byrde, R. J. W., Long Ashton Research Station, Bristol BS18 9AF, England. (027-239-2181)	(1)	UK
Cadic, A., Station d'Amelioration des Especes Fruitieres et Ornementales, Beaucouze 49000 Angers, France (16-41-73.51.25)	(2)	FR

Calzolari, Alessandra, Osservatorio per le Malattie delle Piante, Via di Corticella 135, 40129 Bologna, Italy. (051-352918)	(3)	ITA
Cao, R., Department of Plant Protection, Zhejiang Agricultural University, Hangzhou, Zhejiang, Peoples Republic of China. (42605)	(3)	CHI
Carrera, M., Dept. Agricultura, Ganaderia y Montes, Serv. Invest. Agraria, Apt. 727, 50080 Zaragoza, Spain.	(3)	SPN
Carroll, V. J., Chemicals Division, Pfizer Inc., 235 East 42nd Street, New York, New York 10017. (212-573-2643)	(1)	USA
Cartwright, D. N., Plant Quarantine Div., South Austr. Dept. of Agric., Box 1671, G.P.O., Adelaide, South Australia 5001. (08-2668333)	(3)	AUS
Centre for Agricultural Publishing and Documentation (PUDOC), P.O. Box 9100, 6700 AA Wageningen, The Netherlands. (08370-84440)	(2)	NL
Chandler, D., 1006 S. 32nd Avenue, Yakima, Washington 98902. (509-253-3414)	(2)	USA
Chevalier, R., Laboratoires Riker, 3M Sante Ave. du 11 Novembre, 45312 Pithiviers Cedex, France	(2)	FR
Chouibani, M., D.P.V.C.T.R.F., B.P. 1308, Rabat, Morocco	(3)	MOR
Christensen, F. G., The Royal Veterinary and Agricultural University, Arboretum, 2970 Horsholm, Denmark. (02-860641)	(2)	DK
Chronica Horticulturae (Editor), ISHS, De Dreijen 6, 6703 BC Wageningen, The Netherlands.	(2)	NL
Civerolo, E. L., National Program Staff, U.S. Department of Agriculture, Room 230, Building 005, BARC-West, Beltsville, Maryland 20705. (301-344-3915)	(2)	USA
Cline, R. A., Horticulture Research Institute of Ontario, Vineland Station, Ontario L0R 2E0, Canada. (416-562-4141)	(2)	CND
Close, T.J., Dept. of Plant Path., Univ. of Calif., Davis, Calif. 95616 (916-752-7231)	(2)	USA
Cooper, R. M., School of Biology Sciences, University of Bath, Claverton Down, Bath, Avon BA2 7AY, England	(1)	UK
Coulombe, L. J., Agriculture Canada, P.O. Box 457, St. Jean, Quebec J3B 6B8, Canada. (514-346-4494)	(2)	CND

Covey, R. P., Tree Fruit Research Center, 1100 North Western Avenue, Wenatchee, Washington 98801. (509-663-8181)	(1)	USA
Crassweller, R. M., Cooperative Extension Service, University of Georgia, Athens, Georgia 30602. (404-542-2861)	(2)	USA
Cummins, J. N., Department of Pomology & Viticulture, N.Y. State Agr. Expt. Station, Geneva, New York 14456. (315-787-2233)	(1)	USA
Dale, T., Norwegian Plant Inspection Service, P.O. Box 94, Okern, 0509 Oslo 5, Norway. (47-2648887	(2)	NOR
Davidson, J. G. N., Agriculture Canada, Research Station, Box 29, Beaverlodge, Alberta TOH OCO, Canada. (403-354-2212)	(2)	CND
Deckers, T., Opzoekingsstation van Gorsem, Brede Akker 3, 3800 St. Truiden, Belgium. (011-682019)	(1)	BLG
De Ley, J., Lab. voor Microb. en Microb. Genetica, Rijksuniv. Gent, K. L. Ledeganckstr. 35, 9000 Gent, Belgium. (22-78-21)	(1)	BLG
del Solar, C. E., Departamento Fruticultura, Univ. Catolica de Chile, Moneda 611, Dept. 51, 1 Santiago, Chili. (384200)	(3)	CHL
Dimova, Maria, Plant Protection Section, Department of Agriculture, Nicosia, Cyprus (21-40-2254).	(2)	CYP
Dinesen, G., Institute of Plant Pathology, Lottenborgvej 2, 2800 Lyngby, Denmark. (0287-2510)	(2)	DK
Douglas, Sharon M., Dept. of Plant Pathology & Ecology, Conn. Agric. Expt. Sta., P.O. Box 1106, New Haven, Conn. 06504 (203-789-7222)	(2)	USA
Drake, C. R., Department of Plant Pathology & Physiology, Virginia Polytechnic Institute, Blacksburg, VA 24061. (703-961-5251)	(2)	USA
Drewitt, W., New Zealand Apple & Pear Board, Private Bag, New Zealand. (04-731-240)	(2)	NZ
Ebbels, D. L. Ministry of Agric., Fish. & Food, Harpenden Laboratory, Harpenden, Herts AL5 2BD, England. (05827-5241)	(2)	UK
Egolf, D. R., U. S. National Arboretum, 3501 New York Ave., Washington, D.C. 20002. (202-475-4862)	(1)	USA
Egli, T., Ciba-Geigy Chem. Company Ltd., AC 2.82, 4002 Basel, Switzerland.	(3)	SWT

El-Kazzaz, M. K., Department of Agric. Botany, Faculty of Agric., Tanta University, Kafr El-Sheikh, Egypt.	(1)	EGY
Ellis, M. A., Department of Plant Pathology, Ohio Agric. Research and Devel. Center, Wooster, Ohio 44691. (216-263-3700)	(1)	USA
El-Said, S., Department of Medical Entomology, Ain-Shams University, Cairo, Egypt. (822-030)	(2)	EGY
Epton, H. A. S., Department of Botany, University of Manchester, Manchester M13 9PL, England. (061-2737121)	(1)	UK
Ercolani, G. L., Istituto di Microbiologia Agraria e Tecnica, Facolta di Agraria, Via Amemdola 165/A, 70126 Bari, Italy (080-339422)	(3)	ITA
Evans, E. J., A.D.A.S., Block A, Government Offices, Coley Park, Reading RG1 6DT, England	(1)	UK
Evans, I. R., Alberta Agriculture, Plant Industry Div., Crop Protection Branch, 7000 113 Street, Edmonton, Alberta T6H 5T6, Canada. (403-427-5350)	(2)	CND
Fahy, P. C., Biological & Chem. Research Institute, Dept. of Agric. P.M.B.10, Rydalmere, N.S.W. 2116, Australia. (02-630-0251)	(3)	AUS
Feliciano, Ascunia J. (Connie), EMBRAPA/UEPAE de Cascata, Caixa Postal 403, Pelotas 96.100, Rio Grande do Sul, Brazil.	(3)	BRA
Fideghelli, C., Istituto Sperim. Frutticoltura, Via di Fioranello 52, Ciampino Aeroporto, 00040 Rome, Italy.	(3)	ITA
Fox, R. T. V., Dept. of Horticulture, Earley Sate, University of Reading, Reading, RG6 2AY, England. (734-875123).	(2)	UK
Franz, W., Amt fur Land-und Wasserwirtschaft, Abt. Pflanzensch., Schonbockener Str. 102, 2400 Lubeck, West Germany. (0451-45551)	(2)	BRD
French, J. R., FMC Corp., 100 Niagara Street, Middleport, New York 14105. (716-735-3761, ext. 361)	(2)	USA
Fucikovsky, L., Centro de Fitopatologia, Colegio de Postgraduados, Escuela Nacional de Agricultura, A.P. #85, 56230 Montecillos-Chapingo, Mexico. (595-45211)	(2)	MEX
Fujita, K., Aomori Field and Horticultural Expt. Station Gonohe, San-nohe-Gun, Aomori 039-07, Japan	(3)	JAP
Gantotti, B. V., Department of Bacteriology, University of California, Davis, Calif. 95616. (916-756-0283).	(1)	USA

Garibaldi, A., Istituto di Patologia Vegetale, Via Giuria 15, 10126 Torino, Italy. (011-6505236)	(3)	ITA
Garrett, Constance M. E., Dept. of Plant Pathology, Inst. of Hortic. Research, East Malling, Maidstone, Kent, ME19 6BJ, England (0732-843833)	(1)	UK
Geenen, J., Rijksstation voor Plantenziekten, Burg. van Gansberghelaan 96, 9220 Merelbeke, Belgium. (091-522083)	(2)	BLG
Gessner, E., Institute fur Pflanzenschutz, Saatgutunter Suchung u. Bienenkunde der Landwirt - Schaftskammer Westf. - Lippe, Nevinghoff 40, 4400 Munster, West Germany (0251-276669)	(1)	BRD
Gibbins, L. N., Department of Microbiology, University of Guelph, Guelph, Ontario N1G 2W1, Canada (519-824-4120, ext. 3477)	(2)	CND
Goodman, R. N., Dept. of Plant Pathology, University of Missouri, Columbia, Missouri 65211. (314-882-7043)	(1)	USA
Goto, M., Laboratory of Plant Pathology, Faculty of Agriculture, Shizuoka University, 836 Ohya, Shizuoka 422, Japan. (0542-37-1111, ext. 827)	(3)	JAP
Graberg, Maria, National Board of Agriculture, Plant Protection Service, 551 83 Jonkoping, Sweden. (036-16.94.20)	(2)	SWD
Graf, H., Obstbauversuchsanstalt, Westerminnerweg 22, 2155 Jork, West Germany. (04162-7511)	(2)	BRD
Grimm, R., Federal Res. Station for Fruit-growing, Viticulture and Hortic., 8820 Wadenswil, Switzerland. (01-783.6307)	(3)	SWT
Gupta, G. K., Fruit Pathology Laboratory, Regional Fruit Res. Station, Black Rock, Mashobra, Simla 7, H.P., India. (8261).	(3)	IND
Hale, C. N., Plant Diseases Div., Dept. of Scientific and Industrial Research, Private Bag, Auckland, New Zealand. (893660)	(1)	NZ
Harnish, W., Agric. Chem. Div., Food & Machinery Corporation, 100 Niagara Street, Middleport, New York 14105. (716-735-3761)	(2)	USA
Hattingh, M.J., Department of Plant Pathology, Univ. of Stellenbosch, Stellenbosch 7600, South Africa (02231-77798)	(3)	SA

Heimann, Mary Francis, Dept. Plant Pathology, University of Wisconsin, Russell Labs., 1630 Linden Drive, Madison, Wisconsin 53706. (608-262-2863)	(1)	USA
Heybroek, H. M., Dorschkamp Research Inst. for Forestry and Landscape Planning, P. O. Box 23, 6700 AA Wageningen, The Netherlands. (08370-95360)	(1)	NL
Hickey, K. D., Fruit Research Laboratory, Penn. State Univ., Box 309, Biglerville, Pennsylvania 17307. (717-677-6116)	(2)	USA
Hignett, R. C., 8 Shernolds, Maidstone, Kent ME15 9QG, England. (0622-44116)	(4)	UK
Hoppe, H., Pflanzenschutzamt Hannover, Bez. Stelle Bremervorde, Neue Str. 22, 2140 Bremervorde, West Germany.	(2)	BRD
Howard, R. J., Alberta Hort. Res. Center, BAG Service 200, Brooks, Alberta T0J 0J0, Canada (403-362-3391)	(2)	CND
Hummer, Kim, Curator, USDA, ARS, Nat. Clonal Germpl. Reposit., 33447 Peoria Rd., Corvallis, Oregon 97330. (503-757-4448)	(2)	USA
Hunter, C. L., Plant Industry Branch, Ontario Ministry of Agriculture and Food, P. O. Box 587, Simcoe, Ontario N3Y 4N5, Canada. (519-426-7120)	(1)	CND
Janick, J., Department of Horticulture, Purdue Univeristy, West Lafayette, Indiana 47907. (317-494-1329).	(1)	USA
Janse, J. D., Plant Protection Service, Geertjesweg 15, P.O. Box 9102, 6700 HC Wageningen, The Netherlands. (08370-96300)	(1)	NL
Johnson, D. E., 3310 Jefferson Ave., Yakima, Wash. 98902.	(2)	USA
Jones, A. L., Department of Botany & Plant Pathology, Michigan State University, East Lansing, Michigan 48823. (517-355-4573)	(1)	USA
Jones, D. R., Agricultural Development and Advisory Service, Min. of Agric., Fisheries, and Food, Burghill, Rd., Westbury-on-Trym, Bristol BS10 6NJ, England. (0272-591000)	(1)	UK
Joseph, E., Service Phytosanitaire, Div. de l'Agriculture, Martenhofstr. 5, 3003 Bern, Switzerland.	(3)	SWT
Kado, C. I., Department of Plant Pathology, University of California, Davis, Calif. 95616. (916-752-0325)	(2)	USA
Kato, T., Research Department - Pesticides Div., Institute for Biological Science, Sumitomo Chemical Co., Ltd., 4-2-1, Takatsukasa, Takarazuka, Hyogo, 665, Japan.	(3)	JAP

Keck, Marianne, Bundesanstalt fur Pflanzenschutz, Trunnerstrasse 5, 1020 Vienna, Austria (0222-24.15.11) (3) OST

Kleinhempel, H., Inst. fur Phytopathologie, Akad. Landwirtsch. Wissensch., Theodor-Roemer-Weg 4, 4320 Aschersleben, East Germany. (5141) (1) DDR

Klement, Z., Dept. of Pathophysiology & Disease Resistance, Plant Protection Institute, Herman Otto u. 15, P.O. 102, 1525 Budapest, Hungary. (358-137) (3) HUN

Klos, E. J., Department of Botany & Plant Pathology, Michigan State Univ., East Lansing, Michigan 43823. (517-355-4680) (1) USA

Knosel, D., Inst. fur Angewandte Botanik, Univ. of Hamburg, Marseiller Str. 7, 2000 Hamburg 36, West Germany. (040-4123-2353) (1) BRD

Koenigshof, R., Pear Research Association, Box 4050, Kerlikowske Rd., Coloma, Michigan 49038. (616-849-2375) (2) USA

Kooistra, T., Plant Protection Service, Geertjesweg 15, P.O. Box 9102, 6706 EA Wageningen, The Netherlands. (08370-96400) (1) NL

Krebs, E. K., Pflanzenschutzant Hannover, Wunstorfer, Str. 9, 3000 Hannover, West Germany. (0511-4005173) (2) BRD

Kroeker, G., Swedish Univ. of Agric. Sciences, Box 7036, 75007, Uppsala 7, Sweden. (018-102000) (2) SWD

Kuck, K. H., Bayerwerk, Pflanzenschutz Anwendungstechnik, Biologische Forschung, 5090 Leverkusen, West Germany. (02172-306081) (2) BRD

Kudela, V., Institute of Plant Protection, Research Inst. for Crop Production, Ruzyne 507, 16106 Prague 6 Czechoslovakia. (360851-9) (1) CZE

Kuhne, H., Pflanzenschutzamt der Ldw. Kammer Weser-Ems, Mars-la-Tour-Str. 9/11, 2900 Oldenburg, West Germany. (2) BRD

Lacy, G. H., Department of Plant Pathology, Conn. Agric. Expt. Station, New Haven, Conn. 06504. (203-789-7222) (2) USA

Laere, O. van, Research Station for Nematology and Entomology, Burg, van Gansberghelaan 96, 9220 Merelbeke, Belgium. (091-52.20.85) (1) BLG

Lamb, R. C., Department of Pomology & Viticulture, N. Y. State Agr. Expt. Station, Geneva, New York 14456. (315-787-2235) (1) USA

Landis, W. R., Agric. Chem. Development, MSD Agvet Division, P. O. Box 2000, Rahway, New Jersey 07065. (201-574-6605)	(2)	USA
Laroche, M., Centre d'Etudes des Phytobacterioses, Lab. de Phytopathologie, 3 Place Croix du Sud., Sci. 15 D, 1348 Louvain-La-Neuve, Belgium. (010-433746)	(1)	BLG
Larue, P., Service de la Protection des Vegetaux, Lycee Agricole de Dax, B.P.I, Heugas, 40180 Dax, France.	(1)	FR
Lecomte, P., Laboratoire Feu Bacterien, Lycee Agricole d-Oereluy, B.P. 63-40102, 40990 Dax, France. (16-58-98.70.33)	(1)	FR
Lehmann-Danzinger, H., Inst. fur Pflanzenpath. und Pflanzensch., Grisebachstr. 6., 3400 Gottingen, West Germ.	(2)	BRD
Letal, J., Regional Crops Laboratory, Box 10, Olds, Alberta TOM IPO, Canada. (403-556-8421)	(2)	CND
Lin, C.P., Dept. of Plant Pathology and Entomology, National Taiwan Univ., Taipei, Taiwan, Rep. of China (ROC)	(3)	TAW
Lockhart, C.L., Agriculture Canada, Research Station, Kentville, Nova Scotia B4N 1J5, Canada	(2)	CND
Lombard, P. B., Department of Horticulture, Oregon State University, Corvallis, Oregon 97331. (503-754-3695)	(2)	USA
Lopes Barardo, R., Delgada, 2540 Bombarral, Portugal. (062-62897)	(3)	POR
Lopez Gonzales, M., Dept. Proteccion Vegetal, I.N.I.A., CRIDA 07, Moncada-Valencia, Spain. (139-1000)	(3)	SPN
Luchene, K., van, Ministerie van Landbouw, Dienst Planten-bescherming, Gebrs. Vandeveldestraat 68, 9000 Gent, Belgium.	(1)	BLG
Lux-Wellenhof, E., Ciba-Geigy GmbH, Postfach 11.03.53, 6000 Frankfurt 11, West Germany (0611-7155.257)	(2)	BRD
Mansergas, A. J. F., Ministerio de Agricultura, Departamento de Fruticultura, Apartado 202, Zaragoza, Spain. (976-29 72 07)	(3)	SPN
Mansfield, J.W., Biological Sciences Dept., Wye College, Wye, Ashford TN25 5AH, England (812401-0233)	(2)	UK
Mappes, D., BASF, Agricultural Research Station, P.O. Box 220, 6703 Limburgerhof, West Germany. (6236-68299)	(2)	BRD
Markovic, S., Federal Committee for Agriculture, Bulevar AVNOJ-a 104, 11070 New Belgrade, Yugoslavia (011-604-669)	(3)	YUG

Maroquin, C., Station de Phytopathologie de l'Etat, 13 Ave. Marechal Juin, 5800 Gembloux, Belgium. (081-612094 or 612099) (2) BLG

Martins, J. M. S., Dept. Fitopatologia, Estacao Agronomica Nacional, 2780 Oeiras, Portugal. (3) POR

Massfeller, D., Pflanzenschutzamt der Ldw. Kammer Rheinland, Ludwig Erhard Str. 99, 5300 Bonn-2, West Germany. (0228-376931) (1) BRD

Mazzucchi, U., Laboratorio Fitobatteriologia, Istituto Patol. Vegetale, via Filippo Re 8, 40126 Bologna, Italy. (051-236175) (3) ITA

McPhee, W. J., Okanagan Similkameen Coop. Growers Assoc., East 9th St., Oliver, Brit. Columb. VOH 1TO, Canada (604-498-3491) (2) CND

Meijneke, C. A. R., Plantsoen 168, 6701 AT Wageningen, The Netherlands. (08370-13228) (4) NL

Mendoza, H. A., Centro de Fitopatologia, Colegio de Postgraduados, 56230 Chapingo, Est. de Mexico, Mexico (5-85-45-55 ext. 5406) (1) MEX

Meyer, F. C., Catedra de Fitopatologia, Facultad de Ciencias Agrarias, Universidad Nacional del Comahue, 8303 Cinco Altos, Argentina. (3) ARG

Meyer, J., Amt fur Land-und Wasserwirtschaft, Abteilung Pflanzenschutz, Herzog-Adolf Strasse 1b, 225 Husum, West Germany. (04841-2746) (1) BRD

Michel, H. G., Landesanstalt fur Pflanzenschutz, Reinsburgstr. 107, 7000 Stuttgart - 1, West Germany. (0711/6676-2575 or 73) (2) BRD

Michon, P., 3-M, Health Care, 40 Rue Gabriel Crie, 92245 Malakoff Cedex, France (2) FR

Mielke, G., Mid-Columbia Expt. Sta., 3005 Expt. Station Drive, Hood River, Oregon 97031 (2) USA

Miller, R. W., Dept. of Plant Path. and Physiol., Clemson Univ., Clemson, South Carolina 29634-0377. (803-656-2335) (2) USA

Morehead, G. W., Farm Advisors Office, 4145 Branch Center Road, Sacramento, California 95827. (916-366-2013) (1) USA

Morton, H. V., Ciba-Geigy Corp., P.O. Box 18300, Greensboro, North Carolina 27419. (919-292-7100, ext. 2756) (2) USA

Mosegaard, J., Dansk Plantekoleejer Forening, Elmedals Allee 33, 5250 Fruens Boge, Denmark. (2) DK

Muir, J., Alberta Agriculture, Crop Protection Lab., P.O. Box 7777, Fairview, Alberta, TOH 1LO, Canada.	(2)	CND
Norelli, J. L., Department of Plant Pathology, N.Y. State Agric. Expt. Station, Geneva, New York 14456. (315-787-2317)	(1)	USA
Noval, Cristina, Subdireccion General de Sanidad Vegetal, C/Juan Inst. Nacional de Investigaciones Agrarias, Bravo, 3-B, 1ª planta, 28006 Madrid, Spain. (401-30-28)	(3)	SPN
Nuncio, O., Apartado Postal 576, Saltillo, Coah., Mexico	(2)	MEX
Oberhofer, H., Sudtiroler Beratungsring fur Obst und Weinbau, A. Hoferstrasse 9, 39011 Lana, Sudtirol, Italy.	(3)	ITA
Oktem, Y. E., Zirai Mucadele Arastirma Enstitusu, Fatih Cad., No. 37, Kalaba (Ankara), Turkey.	(3)	TUR
Okuse, I., Faculty of Agriculture, Laboratory of Hortic., Hirosaki University, Hirosaki, Aomori-Ken 036, Japan.	(3)	JAP
Opgenorth, D. C., Department of Plant Pathology, Univ. of California, Riverside, Calif. 92507. (714-787-4119)	(2)	USA
Otterbacher, A., University of Illinois, 105 Hortic. Field Laboratory, Urbana, Illinois 61801. (217-333-1520)	(2)	USA
Palacios, C. J., Campo Agricola Experimental "Valle de Juarez", Apdo. Postal 2244, Praxedis Guerrero, C. P. 32300, Ciudad Juarez (Chih.), Mexico. (91-161-33036)	(1)	MEX
Palazon, I., Departmento de Proteccion Vegetal, Centro de Investigaciones y Desarrollo Agrario del Ebro, Apartado 727, 60080 Zaragoza, Spain. (76-709311)	(3)	SPN
Panagopoulos, C. G., Laboratory of Phytopath., Athens College of Agric. Sciences, Votanikos, 11855 Athens, Greece. (01-3468-437)	(2)	GRC
Pashiardis, S., Meteorological Service, Nicosia, Cyprus.	(1)	CYP
Paulin, J. P., Station de Phytobacteriologie, I.N.R.A., Route de St. Clement, Beaucouze, 49000 Angers, France. (16-41-73-51-44)	(1)	FR
Pecknold, P. C., Department of Botany & Plant Pathology, Purdue University, West Lafayette, Indiana 47907. (317-749-6530)	(2)	USA
Persiel, F., Bundesforschungsanstalt fur Gartenbauliche Pflanzenzuchtung, Bornkampsweg, 2070 Ahrensburg, West Germany. (04102-51122)	(1)	BRD

Persson, Paula, Dept. of Plant and Forest Protection, Swedish Univ. of Agric. Sciences, P.O. Box 7044, 75007 Uppsala, Sweden (018-17.23.58)	(2)	SWD
Porreye, W., Research Station of Gorsem, Brede Akker 3, 3800 Sint-Truiden, Belgium. (011-682019)	(1)	BLG
Prescewski, J. L., Product Development Dept., Stark Brothers Nurseries Co., Louisiana, Missouri 63353. (314-754-5009)	(2)	USA
Preiser, F., Research Laboratories, Merck and Company, Inc., Bldg. R123-12, Rahway, New Jersey 07065. (201-574-6687)	(2)	USA
Prillwitz, H. G., Landespflanzenschutzamt, Essenheimerstr. 144, 6500 Mainz - Bretzenheim, West Germany.	(2)	BRD
Psallidas, P. G., Benaki Phytopathological Institute, 8 Delta Str., 14561 Kiffissia, Athens, Greece. (01-8078832)	(1)	GRC
Quarta, Roberta. Istit. Sperimentale Frutticoltura, via Fioramello 52, Ciampino Aeroporto, Rome 00040 (600098-600251)	(3)	ITA
Rackham, R. L., Benton County Extension Service, 2720 N.W. Polk Street, Corvallis, Oregon 97330. (503-776-7371)	(1)	USA
Rankovic, M., Fruit Research Institute, 32000 Cacak, Yugoslavia (032-47-411)	(3)	YUG
Richiteanu, A., Trustul Pomiculturii, 0300 Pitesti-Maracineni, Romania (916-32066)	(3)	ROM
Ries, S. M., Department of Plant Path., Univ. of Illinois, N-427 Turner Hall, 1102 S. Goodwin, Urbana, Ill. 61820. (217-333-1523)	(1)	USA
Ristevski, B., Fruit Research Station, Faculty of Agric, 91000 Skopje, Yugoslavia (091-230-557)	(3)	YUG
Ritchie, D. F., Department of Plant Pathology, N. C. State University, Raleigh, North Carolina 27695. (919-737-2721)	(2)	USA
Roberts, I., Dept. of Microbiology, Univ. of Leicester, Leicester, LEI 7RH, England.	(1)	UK
Rom, R. C., Dept. of Hortic., Room 316, Plant Science Bldg. Univ. of Arkansas, Fayetteville, Ark. 72701. (501-575-2603)	(2)	USA
Rosenberger, D. A., New York Agric. Exp. Station, Box 727 Highland, New York 12528. (914-691-7151)	(2)	USA

Rousselle, G. L., Agriculture Canada, Sen. Herve J. Michaud Expt. Farm, Bouctouche, New Brunswick EOA 1GO, Canada (506-743-2464)	(2)	CND
Rowson, G. R., Farms Division, Showerings Ltd., Woolston, North Cadbury, Yeovil, Somerset. BA22 7BL, England (N. Cadb. 40166)	(1)	UK
Rudoplh, K., Institut fur Pflanzenpath. und Pflanzensch., Grisebachstr. 6, 3400 Gottingen, West Germany. (393721)	(2)	BRD
Ryugo, K., Department of Pomology, University of California, Davis, California 95616. (916-752-0929)	(2)	USA
Sampson, P. J., Department of Agric., G.P.O. Box 192B, Hobart, Tasmania 7001, Australia (002-284851)	(3)	AUS
Sanchezmonge, E., Departamento Genetica, Estac. Agronomos, Ciudad Universitaria, Madrid 3, Spain.	(3)	SPN
Sands, D. C., Dept. of Plant Path., Montana State Univ., Bozeman, Montana 59717. (406-994-4832)	(2)	USA
Sawatzky, R., Dept. of Hortic. Science, Univ. of Saskatchewan, Saskatoon S7N OWO, Canada. (306-343-4241)	(1)	CND
Schafer, T.W., Agri-Shield, Inc., P.O. Box 71391, Marietta, Georgia 30007 (404-587-1833)	(1)	USA
Scheer, H. A. T. van der, Research Station for Fruit Growing, Brugstraat 51, 4475 AN Wilhelminadorp, The Netherlands. (01100-16390)	(2)	NL
Schilli, E., Inst. fur Phytomedizin, Univ. Hohenheim, Otto-Sanderstrasse 5, 7000 Stuttgart-70, West Germany	(2)	BRD
Schouten, H. J., Dept. of Phytopathology, Agric. University, Binnenhaven 9, 6709 PD Wageningen, The Netherlands (08370-83404)	(1)	NL
Schroth, M. N., Department of Plant Pathology, Univ. of California, Berkeley, Calif. 94720. (415-642-4147)	(1)	USA
Schulz, F. A., Inst. fur Phytopath., Christ.-Albrechts Univ., Olshausenstrasse 40-60, 2300 Kiel, West Germany. (0431-880-2996)	(1)	BRD
Schwabe, W. F. S., Fruit and Fruit Tech. Res. Inst., Private Bag 5013, 7600 Stellenbosch, South Africa (02231-2001)	(3)	SA
Seem, R. C., Department of Plant Pathology, N.Y. State Agric. Expt. Station, P. O. Box 462, Geneva, NY 14456. (315-787-2366)	(2)	USA

Severin, V., Laboratory of Phytobacteriology, Research Inst. for Plant Protection, Blvd. Ion Ionescu de la Brad 8, Bucharest-Baneasa, Romania. (33.58.50-58)	(3)	ROM
Shabi, E., Division of Plant Pathology, Agricultural Research Organization, Volcani Centre, Bet Dagan 50250, Israel (972-03.980.535)	(1)	ISR
Sharma, V. P., Dept. of Plant Pathology, Haryana Agric. University, Hissar 125004, India	(3)	IND
Sholberg, P. Agriculture Canada, Research Station, Summerland, Brit. Columb. VOH 1ZO Canada. (604-494-7711)	(1)	CND
Simon, Erzsebet. Plant Quarantine Laboratory, Plant Protection and Agrochemical Station, P.O. Box 99, 6801 Hodmezovasarhely, Hungary (62-46611)	(3)	HUN
Simonsen, J., State Experimental Station, Laasbyvej 18, 8660 Skanderborg, Denmark. (06-520877)	(2)	DK
Singh, B. P., USDA, APHIS, Federal Center Bldg., Room 627, 6505 Belcrest Rd., Hyattsville, MD 20782 (301) 436-5215	(2)	USA
Slack, D., Dept. of Plant Pathology, Univ. of Arkansas, Fayettsville, Arkansas 72701. (501-575-2446)	(1)	USA
Sletten, A., Dept. of Plant Pathology, Norwegian Plant Protection Institute, Box 70, 1432 AS-NLH, Norway	(1)	NOR
Smith, A. R. W., School of Biolog. Sciences and Environmental Health, Thames Polytechnic, Wellington Street, London SE18 6PF, England	(1)	UK
Smith, I. N., European and Mediter. Plant Protect. Organ., 1 rue Le Notre, 75016 Paris, France. (1-45-20-77-94)	(2)	FR
Smith, T.J., Chelon-Douglas Extension, 400 Washington, Wenatchee, Wash. 98801. (509-663-1121)	(2)	USA
Sobiczewski, P., Research Institute of Pomology, ul. Pomologiczna 18, 96-100 Skierniewice, Poland. (Skierniewice 34-21)	(1)	POL
Spotts, R. A., Mid-Columbia Expt. Station, 3005 Expt. Station Drive, Hood River, Oregon 97031. (503-386-2030)	(2)	USA
Stead, D., Min. Agric., Fish. and Food, Harpenden Laboratory, Hatching Green, Harpenden, Herts AL5 2BD England (5241)	(1)	UK
Steiner, P., Department of Botany, University of Maryland, College Park, Maryland 20742. (301-454-3816)	(2)	USA
Stino, G. R., Dept. of Horticulture, Faculty of Agriculture, Cairo University, Giza (Cairo), Egypt	(2)	EGY

Sugar, D., Southern Oregon Expt. Station, 569 Hanley Rd., Medford, Oregon 97502. (503-772-5165)	(2)	USA
Sumida, T., Pesticides Devel. Div., Sumitomo Chem. America, Inc. 345 Park Ave., New York, NY 10154 (212-207-0600)	(2)	USA
Suta, Victoria, Research Institute for Fruit Growing, 0300 Pitesti-Maracineni, Romania (976-34292)	(3)	ROM
Sutton, T. B., Department of Plant Pathology, N.C. State Univ., Raleigh, North Carolina 27695-7616 (919-737-2752)	(1)	USA
Swanson, B. T., Dept. of Horticulture, 356 Alderman Hall, University of Minnesota, St. Paul, Minnesota 55108. (612-373-1011)	(1)	USA
Taylor, D. Ministry of Agric., Fish & Food, National Fruit Trials, Brogdale Exp. Hort. Station, Faversham, Kent ME13 8XZ, England. (079582-5462/3/4)	(1)	UK
Teylingen, M. van, Plant Protection Service, Geertjesweg 15, P.O. Box 9102, 6706 EA Wageningen, The Netherlands. (8370-96911)	(2)	NL
Thibault, B., Station d'Arboriculture Fruitiere, I.N.R.A., Route de St. Clement, Beaucouze, 49000 Angers, France. (16-44-73-51.08)	(1)	FR
Thompson, J. M., Route 2, Box 2993, Blairsville, Georgia 30512 (404-745-3558)	(4)	USA
Thomson, S. V., Department of Biology, UMC 53, Utah State Univ. Logan, Utah 84322-5305. (801-750-3406)	(1)	USA
Timmermans, Y., Lab. de Phytopathologie, Centre d'Etudes de Phytobacterioses, 3 Place Croix du Sud, Sci. 15 D, 1348 Louvain-La-Neuve, Belgium (010-433752)	(1)	BLG
Travis, J. A., Department of Plant Pathology, Penn State University, Buckhart Lab., University Park, PA 16802.	(2)	USA
Tsiantos, J., Plant Protection Inst., 38001 Volos, Greece (0421-60601)	(2)	GRC
United States Department of Agriculture, Library Records Division, Agric. Res. Center, Beltsville, Maryland 20705.	(2)	USA
Van Buskirk, P. D., Jackson County Extension Service, 1301 Maple Grove Drive, Medford, Oregon 97501 (503-776-7381)	(1)	USA
Vantomme, R., Laboratory for Microbiology, Research Center for Fytobacterioses, K. L., Ledeganckstraat 35, 9000 Gent, Belgium. (091-227821)	(1)	BLG

Veldeman, R., Ministry of Agriculture, Research Station for Phytopathology, Burg, van Gansberghelaan 96, 9220 Merelbeke, Belgium. (091-522083)	(2)	BLG
Vereecke, M., Plant Protection Service, Ministry of Agric., Manhattan Center, Bolwerklaan 21, 1210 Brussels, Belgium (02-211.72.11)	(1)	BLG
Vermaerke, D., Ministerie van Landbouw-Plantenbescherming, St. Lievenslaan 33A, 9000 Gent, Belgium (091-352537)	(1)	BLG
Vidal, R., Casilla 12, Teno, Chili. (75-411105)	(3)	CHL
Viseur, J., Centre de Lutte Integree en Phytopathologie, I.R.S.I.A., Avenue Marechal Juin 13, 5800 Gembloux, Belgium (081-61.01.26)	(1)	BLG
Vogelsanger, D., Pflanzenschutzamt, Hermannswerder 20A, 15 Potsdam, East Germany.	(2)	DDR
Vondracek, J., Fruit Research Station, Techobuzize, 411 42 Ploskovice (okr. Litomerice), Czechoslovakia. (Ploskovice 9387)	(2)	CZE
Voronkova, L., Dept. of Bacteriology, Central Laboratory for Plant Quarantine, 1/11 Orlikov per., 107139 Moscow, B-139, Russia.	(3)	RUS
Vuurde, J. W. L. van, Research Institute for Plant Protect., Binnenhaven 12, P.O. Box 9060, 6700 GW Wageningen, The Netherlands (08370-19151)	(2)	NL
Wade, E. K., Department of Plant Pathology, University of Wisconsin, Madison, Wisconsin 53706. (608-262-1426)	(2)	USA
Waldner, W., Sudtiroler Beratungsring fur Obst und Weinbau, Andreas Hoferstrasse, 39011 Lana, Italy	(3)	ITA
Walsh, P. F., Dept. of Agriculture, Agriculture House, Kildare St., Dublin 2, Ireland. (789011, est. 2089)	(2)	IRL
Westwood, M. N., Department of Horticulture, Oregon State University, Corvallis, Oregon 97331. (503-754-3695)	(2)	USA
Wimalajeewa, S., Plant Research Institute, Burnley Gardens Swan Street, Burnley, Victoria 3121, Australia. (8101511)	(3)	AUS
Wodzinski, R. S., Biology Department, Ithaca College, Ithaca, New York 14850. (607-274-3979)	(1)	USA
Yoder, K. S., Fruit Research Laboratory, Va. Polytech. Inst., 2500 Valley Ave., Winchester, Virginia 22601. (703-667-8330)	(1)	USA

Yorston, Y. M., Brit. Columb. Ministry of Agric., Research Station, Summerland, British Columbia V0H 1Z0, Canada. (604-494-0401)	(2)	CND
Young, Debra, Arizona Cooperative Extension Service, 450 S. Haskell, Willcox, Arizona 85643.	(2)	USA
Young, J. M., Plant Diseases Division, MARC, Private Bag, Auckland, New Zealand. (893660)	(2)	NZ
Zaccheo, A., Via Gaggiolo, 6855 Stabio, Ticino, Switzerland (091-472520)	(3)	SWT
Zehr, E. I., Department of Plant Pathology & Physiology, Clemson University, Clemson, South Carolina 29631. (803-656-3450)	(2)	USA
Zeller, W., Biologische Bundesanstalt fur Land und Forstwirtschaft, Institut fur Pflanzenschutz im Obstbau, Schwabenheimerstrasse, Postfach 73, 6915 Dossenheim/Heidelberg, West Germany (06221-85238)	(1)	BRD
Zhang, Z., Dept. of Phytopathology, Inst. of Plant Quarantine, Min. of Agric., Anim. Husb. and Fish., Beijing, China (PRC) (594843)	(3)	CHI
Zoller, B. G., The Pear Doctor, Inc., P.O. Box 952, Yuba City, California 95992. (916-674-1255)	(2)	USA
Zutra, D., Department of Plant Pathology, Agricultural Research Organization, The Volcani Centre, Bet Dagan 50250, Israel (972-03.980.535)	(1)	ISR
Zwet, T. van der, U.S. Department of Agriculture, Appalachian Fruit Research Station, Rt. 2, Box 45, Kearneysville, West Virginia 25430 (304-725-3451, ext. 29)	(1)	USA

Working Group Membership by Country [1/]

Argentina	Bergna, D. A. *Meyer, F. C.	
Australia	*Cartwright, D. N. Fahy, D. C.	Sampson, P. J. Wimalajeewa, S.
Austria	*Keck, M.	
Belgium	Deckers, T. De Ley, J. Geenen, J. Laere, O. van Laroche, M. Luchene, K. van Maroquin, C.	*Porreye, W. Timmermans, Y. Vantomme, R. Veldeman, R. Vereecke, M. Vermaerke, D. Viseur, J.
Brazil	Bredemeier, D. Feliciano, A. J.	
Canada	AGR. CAN. LIBRARY Biggs, A. R. *Bonn, W. G. Braun, P. G. Cline, R. A. Coulombe, L. J. Davidson, J. G. N. *Evans, I. R. Gibbins, L. N. Howard, R. J.	Hunter, C. L. Lethal, J. *Lockhart, C. L. McPhee, R. Muir, J. Rousselle, G. L. *Sawatzky, R. *Sholberg, P. Yorston, Y. M.
China (P.R.)	*Cao, R. Zhang, Z.	
Chili	del Solar, C. E. *Vidal, R.	
Cyprus	*Dimova, M. Pashiardis, S.	
Czechoslovakia	*Kudela, V. Vondracek, J.	
Denmark	Anderson, H. Christensen, F. G. *Dinesen, G.	Mosegaard, J. Simonsen, J.
East Germany (DDR)	*Kleinhempel, H. Vogelsanger, D.	

[1/] Names with asterisk (*) are contact persons.

Egypt	Abo-El-Dahab, M. K. El-Kazzaz, M. K.	*El-Said, S. Stino, G. R.
England (U. K.)	Alston, F. H. Billing, E. Byrde, R. J. W. Cooper, R. M. Ebbels, D. L. Epton, H. A. S. Evans, E. G. Fox, R. T. V. *Garrett, C. M. E.	Hignett, R. C. Jones, D. R. Mansfield, J. W. Roberts, I. Rowson, G. R. Smith, A. R. W. Stead, D. Taylor, D.
France	Balavoine, P. Cadic, A. Chevalier, R. Larue, P. Lecomte, P.	Michon, P. *Paulin, J. P. Smith, I. Thibault, B.
Greece	Panagopoulos, C. G. *Psallidas, P. G.	Tsiantos, J.
Hungary	Klement, Z. *Simon, E.	
India	Gupta, V. K. Sharma, V. P.	
Ireland	*Walsh, P.	
Israel	*Shabi, E. Zutra, D.	
Italy	*Bazzi, C. Calzolari, A. Ercolani, G. Fideghelli, C. Garibaldi, A.	Mazzucchi, E. Oberhofer, H. Quarta, R. Waldner, W.
Japan	*Fujita, K. Goto, M.	Kato, T. Okuse, I.
Mexico	*Fucikovsky, L. Mendoza H., A.	Nuncio, O. Palacios, C. J.
Morocco	Benjama, A. *Chouibani, M.	
Netherlands	Bouma, S. CHRONICA HORTIC. Heybroek, H. M. Janse, J. D. Kooistra, T. Meijneke, C. A. R.	PUDOC Scheer, H. A. T. van der Schouten, H. J. *Teylingen, M. van Vuurde, J. W. L. van

New Zealand	Drewitt, W. *Hale, C. N.	Young, J. M.
Norway	Dale, T. *Sletten, A.	
Poland	Burkowicz, A. *Sobiczewski, P.	
Portugal	Lopes Barardo, R. *Martins, J. M. S.	
Romania	Richiteanu, A. Severin, V.	*Suta, V.
Russia (USSR)	*Voronkova, L.	
South Africa	*Hattingh, M. J. Schwabe, W. F. S.	
Spain	Carrera, M. Lopez Gonzales, M. Mansergas, A. J. F.	Noval, C. *Palazon, I. Sanchezmonge, E.
Sweden	*Graberg, M. Kroeker, G.	Persson, P.
Switzerland	Bolay, A. Egli, T. *Grimm, R.	Joseph, E. Zaccheo, A.
Taiwan	*Lin, C. P.	
Turkey	Baykal, N. *Oktem, Y. E.	
West Germany (BRD)	Baumm, L. H. Franz, W. Gessner, E. Graf, H. Hoppe, H. Knosel, D. Krebs, E. K. Kuck, K. H. Kuhne, H. Lehmann-Danzinger, H. Lux-Wellenhof, E.	Mappes, D. Massfeller, D. Meyer, J. Michel, H. G. Persiel, F. Prillwitz,H. G. Rudolph, H. G. Schilli, E. Schulz, F. A. *Zeller, W.
Yugoslavia	*Arsenijevic, M. Markovic, S.	Rankovic, M. Ristevski, B.

UNITED STATES

Aldwinckle, H. S.
Bates, J. J.
*Beer, S. V.
Bell, R. L.
Beutel J. A.
Biehn, W.
Bushong, J. W.

Carroll, V.
Chandler, D.
Civerolo, E. L.
Close, T. J.
*Covey, R. P.
Crassweller, R.
Cummins, J. N.

*Douglas, S. M.
Drake, C. R.
Egolf, D. R.
*Ellis, M. A.
French, J. R.

Gantotti, B. V.
*Goodman, R. N.
Harnish, W.
Heimann, M. F.
*Hickey, K. D.
Hummer, K.

*Janick, J.
Johnson, D. E.
*Jones, A. L.
Kado, G. I.
Klos, E. J.
Koenigshof, R.

Lacy, G. H.
Lamb, R. C.
Landis, W. R.
Lombard, P. B.

Mielke, G.
*Miller, R. W.
Morehead, G. W.
Morton, H. V.
Norelli, J. L.

Opgenorth, D. C.
Otterbacker, A.
Pecknold, P. C.
Preczewski, J. L.
*Preiser, F.

Rackman, R. L.
*Ries, S. M.
*Ritchie, D. F.
Rom, R. C.
Rosenberger, D. A.
Ryugo, K.

Sands, D. C.
Schafer, T. W.
Schroth, M. N.
Seem, R. C.
Singh, B. P.
*Slack, D.
Smith, T. J.
Spotts, B. P.
*Steiner, P.
*Sugar, D.
Sumida, T.
Sutton, T. B.
Swanson, B. T.

*Thompson, J. M.
*Thomson, S. V.
Travis, J. A.
USDA Library
Van Buskirk, P. D.
*Wade, E. K.
Westwood, M. N.
Wodzinski, R. S.

*Yoder, K. S.
*Young, D.
Zehr, E. I.
*Zoller, B. G.
*Zwet, T. van der

SUMMARY

Contact Persons for Fire Blight Newsletter

United States

Arizona	Young, D.
Arkansas	Slack, D.
California	Zoller, B. G.
Connecticut	Douglas, S. M.
Georgia	Thompson, J. M.
Illinois	Ries, S. M.
Indiana	Janick, J.
Maryland	Steiner, P.
Michigan	Jones, A. L.
Missouri	Goodman, R. N.
New Jersey	Preiser, F.
New York	Beer, S. V.
North Carolina	Ritchie, D. F.
Ohio	Ellis, M. A.
Oregon	Sugar, D.
Pennsylvania	Hickey, K. D.
South Carolina	Miller, R. W.
Utah	Thomson, S. V.
Virginia	Yoder, K. S.
Washington	Covey, R. P.
West Virginia	van der Zwet, T.
Wisconsin	Wade, E. K.

Canada

Alberta	Evans, I. R.
British Columbia	Sholberg, P.
Nova Scotia	Lockhart, C. L.
Ontario	Bonn, W. G.
Saskatchewan	Sawatzky, R.

Other Countries

Argentina	Meyer, F. C.
Australia	Cartwright, D. N.
Austria	Keck, M.
Belgium	Porreye, W.
Chili	Vidal, R.
China (P.R.)	Cao, R.
Cyprus	Dimova, M.
Czechoslovakia	Kudela, V.
Denmark	Dinesen, A.
Egypt	El-Said, S.
England	Garrett, C. M.E.
France	Paulin, J. P.
Germany (East)	Kleinhempel, H.
Germany (West)	Zeller, W.
Greece	Psallidas, P. G.
Hungary	Simon, E.
Ireland	Walsh, P.
Israel	Shabi, E.
Italy	Bazzi, C.
Japan	Fujita, K.
Mexico	Fucikovsky, L.
Morocco	Chouibani, M.
Netherlands	van Teylingen, M.
New Zealand	Hale, C. N.
Norway	Sletten, A.
Poland	Sobiczewski, P.
Portugal	Martins, J. M. S.
Romania	Suta, V.
Russia	Voronkova, L.
South Africa	Hattingh, M. J.
Spain	Palazon, I.
Sweden	Graberg, M.
Switzerland	Grimm, R.
Taiwan	Lin, C. P.
Turkey	Oktem, Y. E.
Yugoslavia	Arsenijevic, M.

SUMMARY

Persons Interested in Fire Blight

Country	Interest Category 1	2	3	4	Total	Number of Contact Persons
1. * USA - United States	30	46		1	77	22
2. * CND - Canada	4	15			19	5
3. * BRD - West Germany	8	13			21	1
4. * UK - England	12	3		2	17	1
5. * BLG - Belgium	11	3			14	1
6. * NL - Netherlands	6	4		1	11	1
7. * FR - France	5	4			9	1
8. * DK - Denmark	1	4			5	1
9. * EGY - Egypt	2	2			4	1
10. * MEX - Mexico	2	2			4	1
11. * NZ - New Zealand	1	2			3	1
12. * GRC - Greece	1	2			3	1
13. * SWD - Sweden		3			3	1
14. * DDR - East Germany	1	1			2	1
15. * POL - Poland	1	1			2	1
16. * ISR - Israel	2				2	1
17. * NOR - Norway	1	1			2	1
18. * CYP - Cyprus	1	1			2	1
19. * CZE - Czechoslovakia	1	1			2	1
20. * IRL - Ireland		1			1	1
21. ITA - Italy			9		9	1
22. SPN - Spain			6		6	1
23. SWT - Switzerland			5		5	1
24. JAP - Japan			4		4	1
25. YUG - Yugoslavia			4		4	1
26. AUS - Australia			4		4	1
27. ROM - Romania			3		3	1
28. HUN - Hungary			2		2	1
29. SA - South Africa			2		2	1
30. ARG - Argentina						
31. POR - Portugal			2		2	1
32. MOR - Morocco			2		2	1
33. CHI - China			2		2	1
34. TUR - Turkey			2		2	1
35. CHL - Chili			2		2	1
36. OST - Austria			1		1	1
37. RUS - Russia			1		1	1
38. TAW - Taiwan			1		1	1
39. BRA - Brazil			2		2	
40. IND - India			2		2	
TOTAL	90	109	58	4	261	63

* Countries with fire blight.

BE SURE TO RETURN THIS PAGE BY DECEMBER 31, 1988 TO RECEIVE 1989 NEWSLETTER

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Fire Blight Mailing List Questionnaire

The list of names in this Newsletter is an annual attempt to establish a complete and updated mailing list of all persons interested in fire blight. Please make corrections and additions where necessary and send me any new names not listed. A new list will be prepared for the next newsletter.

- [ ] My name, address and telephone are correct (if not, show change below)
- [ ] My interest in fire blight is correct (if not, please indicate below)
- [ ] My name should be dropped from this list
- [ ] My/other name should be added to this list

NAME ______________________________

ADDRESS ______________________________

____

ZIP ______________________________

TELEPHONE ______________________

Interest in fire blight research:	1 2 3 4	Please circle one of each
Interest in fire blight newsletter:	YES NO	
I will serve as contact person for newsletter questionnaire:	YES NO	

____

Please return to your contact person or directly to:

T. van der Zwet
Appalachian Fruit Research Station
Route 2, Box 45
Kearneysville, West Virginia 25430